H3C MSR 20/30/50 Series Routers

Interface Card and
Interface Module Manual (v1.00)

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ABOUT THIS GUIDE

This guide describes the various interface cards and interface modules that are available for use with you H3C MSR 20/30/50 Series router.

This guide is intended for qualified service personnel who are responsible for configuring, using, and managing the routers. It assumes a working knowledge of local area network (LAN) operations and familiarity with communication protocols that are used to interconnect LANs.

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Conventions

Table 1 lists icon conventions that are used throughout this guide.

Table 1 Notice Icons

Icon	Notice Type	Description
	Information note	Information that describes important features or instructions.
	Caution	Information that alerts you to potential loss of data or potential damage to an application, system, or device.
	Warning	Information that alerts you to potential personal injury.

Table 2 lists text conventions that are used throughout this guide.

Table 2 Text Conventions

Convention	Description
`Screen displays`	This typeface represents information as it appears on the screen.
Keyboard key names	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+), for example: Press Ctrl+Alt+Del
The words “enter” and “type”	When you see the word “enter” in this guide, you must type something, and then press Return or Enter. Do not press Return or Enter when an instruction simply says “type.”

Table 2 Text Conventions

Convention	Description
Words in *italics*	Italics are used to: Emphasize a point. Denote a new term at the place where it is defined in the text. Identify menu names, menu commands, and software button names. Examples: From the *Help* menu, select *Contents*. Click *OK*.
Words in **`bold`**	Boldface type is used to highlight command names. For example, "Use the **`display user-interface`** command to..."

Related Documentation

The following manuals offer additional information necessary for managing your MSR 20/30/50 Series router:

- *H3C MSR 20/30/50 Series Routers Installation Manuals* — Covers setting up and initializing your router.
- *H3C MSR 20/30/50 Series Routers Configuration Guide* — Describes how to operate the router. It includes sections about getting started, system management, interface, link layer protocol, network protocol, routing protocol, multicast protocol, security, VPN, reliability, QoS, dial-up and VoIP, as well as acronyms used in the manual.
- *H3C MSR 20/30/50 Series Routers Command Reference Guide* — Provides a detailed description of the operating commands. It includes sections about getting started, system management, interface, link layer protocol, network protocol, routing protocol, multicast protocol, security, VPN, reliability, QoS, dial-up and VoIP, as well as a command index.
- *LMR Series Routers Cable Manual* — Describes the pinouts of the cables available for LMR series routers.
- *Release Notes* — Contains the latest information about your product. If information in this guide differs from information in the release notes, use the information in the *Release Notes*.

These documents are available in Adobe Acrobat Reader Portable Document Format (PDF) on the CD-ROM that accompanies your router or on the 3Com World Wide Web site: **http://www.3Com.com**

1 OVERVIEW

This manual covers three broad categories of interface cards and modules available with MSR Series Routers: smart interface card/double smart interface card (SIC/DSIC), multiplex interface module/double multiplex interface module/expand multiplex interface module (MIM/DMIM/XMIM), and flexible interface card/double flexible interface card (FIC/DFIC).

SIC/DSIC Interface Cards

Currently, the following types of SIC/DSIC interface cards are available.

Ethernet interface cards

1-port 10/100/1000 Mbps electrical and fiber interface card (SIC-1GEC)

1-port 10Base-T/100Base-TX Ethernet interface card (SIC-1FEA)

1-port 100 Mbps fiber Ethernet interface card (SIC-1FEF)

4-port 10/100 Mbps Ethernet Layer 2 switching interface card (SIC-4FSW)

9-port 10/100 Mbps Ethernet Layer 2 switching interface card (DSIC-9FSW)

4-port 10/100 Mbps Ethernet Layer 2 switching PoE interface card (SIC-4FSW-POE)

9-port 10/100 Mbps Ethernet Layer 2 switching PoE interface card (DSIC-9FSW-POE)

WAN interface cards

1-port enhanced high-speed synchronous/asynchronous serial interface card (SIC-1SAE)

8-port asynchronous serial interface card (SIC-8AS)

1-port E1/CE1/PRI compatible interface card (SIC-1EPRI)

1-port fractional E1 interface card (SIC-1E1-F)

1-port T1/CT1/PRI compatible interface card (SIC-1TPRI)

1-port fractional T1 interface card (SIC-1T1-F)

1-port analog modem interface card (SIC-1AM)

2-port analog modem interface card (SIC-2AM)

1-port ADSL interface card (SIC-1ADSL)

1-port ADSL over ISDN interface card (SIC-1ADSL-I)

1-port ISDN BRI S/T interface card (SIC-1BS)

2-port ISDN BRI S/T interface card (SIC-2BS)

1-port ISDN BRI U interface card (SIC-1BU)

2-port ISDN BRI U interface card (SIC-2BU)

Voice interface cards

1-port voice subscriber circuit interface card (SIC-1FXS)

2-port voice subscriber circuit interface card (SIC-2FXS)

1-port voice AT0 analog trunk interface card (SIC-1FXO)

2-port voice AT0 analog trunk interface card (SIC-2FXO)

1-port CE1/PRI/R2 compatible interface card (SIC-1VE1)

1-port CT1/PRI compatible interface card (SIC-1VT1)

1-port ISDN BRI S/T voice interface card (SIC-1BSV)

2-port ISDN BRI S/T voice interface card (SIC-2BSV)

MIM/DMIM/XMIM

H3C MSR 30 series routers provide MIM slots and support the following MIM/DMIM/XMIM:

Ethernet modules

1-port 10Base-T/100Base-TX Fast Ethernet interface module (MIM-1FE)

2-port 10Base-T/100Base-TX Fast Ethernet interface module (MIM-2FE)

4-port 10Base-T/100Base-TX Fast Ethernet interface module (MIM-4FE)

1-port 10Base-T/100Base-TX/1000Base-T Ethernet electrical interface module (MIM-1GBE)

2-port 10Base-T/100Base-TX/1000Base-T Ethernet electrical interface module (MIM-2GBE)

1-port 1000Base-SX/1000Base-LX gigabit Ethernet fiber interface module (MIM-1GEF)

2-port 1000Base-SX/1000Base-LX gigabit Ethernet fiber interface module (MIM-2GEF)

16-port 10/100 Mbps Layer 2 switching interface module (MIM-16FSW)

24-port 10/100 Mbps Layer 2 switching interface module (DMIM-24FSW)

16-port 10/100 Mbps Ethernet Layer 2 switching PoE interface module (DMIM-16FSW-POE)

24-port 10/100 Mbps Ethernet Layer 2 switching PoE interface module (DMIM-24FSW-POE)

16-port 10/100 Mbps Ethernet Layer 2 switching interface module (XMIM-16FSW)

24-port 10/100 Mbps Ethernet Layer 2 switching interface module (XMIM-24FSW)

WAN modules

2-port enhanced high-speed synchronous/asynchronous serial interface module (MIM-2SAE)

4-port enhanced high-speed synchronous/asynchronous serial interface module (MIM-4SAE)

8-port enhanced high-speed synchronous/asynchronous serial interface module (MIM-8SAE)

8-port enhanced asynchronous serial interface module (MIM-8ASE)

16-port enhanced asynchronous serial interface module (MIM-16ASE)

1-port channelized E1 interface module (MIM-1E1)

2-port channelized E1 interface module (MIM-2E1)

4-port channelized E1 interface module (MIM-4E1)

8-port channelized E1 interface module (MIM-8E1)

1-port fractional E1 interface module (MIM-1E1-F)

2-port fractional E1 interface module (MIM-2E1-F)

4-port fractional E1 interface module (MIM-4E1-F)

8-port fractional E1 interface module (MIM-8E1-F)

1-port channelized T1 interface module (MIM-1T1)

2-port channelized T1 interface module (MIM-2T1)

4-port channelized T1 interface module (MIM-4T1)

8-port channelized T1 interface module (MIM-8T1)

1-port fractional T1 interface module (MIM-1T1-F)

2-port fractional T1 interface module (MIM-2T1-F)

4-port fractional T1 interface module (MIM-4T1-F)

8-port fractional T1 interface module (MIM-8T1-F)

1-port channelized E3 interface module (MIM-1CE3)

1-port channelized T3 interface module (MIM-1CT3)

4-port ISDN BRI S/T interface module (using jumpers) (MIM-4BSE)

1-port G.SHDSL interface module (MIM-1G.SHDSL)

1-port ATM 155 Mbps multi-mode fiber interface module (MIM-1AMM)

1-port ATM 155 Mbps single-mode fiber interface module (MIM-1ASM)

1-port ATM 155 Mbps single-mode long-haul fiber interface module (MIM-1ASL)

1-port 34 Mbps ATM-E3 interface module (MIM-1AE3)

1-port 44 Mbps ATM-T3 interface module (MIM-1AT3)

8-port E1 ATM inverse multiplexing interface module (MIM-IMA-8E1)

4-port E1 ATM inverse multiplexing interface module (MIM-IMA-4E1)

8-port T1 ATM inverse multiplexing interface module (MIM-IMA-8T1)

4-port T1 ATM inverse multiplexing interface module (MIM-IMA-4T1)

1-port SDH/SONET interface module (MIM-1POS)

1-port channelized SDH/SONET interface module (E1) (MIM-1CPOS (E))

1-port channelized SDH/SONET interface module (T1) (MIM-1CPOS (T))

1-port dual-pair G.SHDSL interface module (MIM-SHL-4W)

Voice modules

2-port voice subscriber circuit interface module (MIM-2FXS)

2-port voice AT0 analog trunk interface module (MIM-2FXO)

2-port voice E&M analog trunk interface module (MIM-2E&M)

4-port voice subscriber circuit interface module (MIM-4FXS)

4-port voice AT0 analog trunk interface module (MIM-4FXO)

4-port voice E&M analog trunk interface module (MIM-4E&M)

1-port E1 voice interface module (MIM-1VE1)

1-port T1 voice interface module (MIM-1VT1)

2-port E1 voice interface module (MIM-2VE1)

2-port T1 voice interface module (MIM-2VT1)

2-port ISDN BRI S/T voice interface module (MIM-2BSV)

4-port ISDN BRI S/T voice interface module (MIM-4BSV)

Encryption modules

Network data encryption module (NDEC)

High-performance network data encryption module (HNDE)

FIC/DFIC Interface Cards

The following are the FIC/DFIC interface cards available with MSR 50 Series Routers:

Ethernet interface cards

1-port 10Base-T/100Base-TX FE interface card (FIC-1FE)

2-port 10Base-T/100Base-TX FE interface card (FIC-2FE)

4-port 10Base-T/100Base-TX FE interface card (FIC-4FE)

1-port 10Base-T/100Base-TX/1000Base-T GE electrical interface card (FIC-1GBE)

2-port 10Base-T/100Base-TX/1000Base-T GE electrical interface card (FIC-2GBE)

1-port 1000Base-SX/1000Base-LX GE fiber interface card (FIC-1GEF)

2-port 1000Base-SX/1000Base-LX GE fiber interface card (FIC-2GEF)

16-port 10/100 Mbps Layer 2 switching interface card (FIC-16FSW)

24-port 10/100 Mbps Layer 2 switching interface card (DFIC-24FSW)

16-port 10/100 Mbps Ethernet Layer 2 switching PoE interface module (FIC-16FSW-POE)

24-port 10/100 Mbps Ethernet Layer 2 switching PoE interface module (DFIC-24FSW-POE)

WAN interface cards

2-port enhanced multiprotocol synchronous/asynchronous serial interface card (FIC-2SAE)

4-port enhanced multiprotocol synchronous/asynchronous serial interface card (FIC-4SAE)

8-port enhanced multiprotocol synchronous/asynchronous serial interface card (FIC-8SAE)

4-port ISDN BRI S/T interface card (using jumpers) (FIC-4BSE)

8-port enhanced asynchronous serial interface card (FIC-8ASE)

16-port enhanced asynchronous serial interface card (FIC-16ASE)

1-port channelized T1/PRI interface card (FIC-1T1)

2-port channelized T1/PRI interface card (FIC-2T1)

4-port channelized T1/PRI interface card (FIC-4T1)

8-port channelized T1/PRI interface card (FIC-8T1)

1-port fractional T1 interface card (FIC-1T1-F)

2-port fractional T1 interface card (FIC-2T1-F)

4-port fractional T1 interface card (FIC-4T1-F)

8-port fractional T1 interface card (FIC-8T1-F)

1-port channelized E1/PRI interface card (FIC-1E1)

2-port channelized E1/PRI interface card (FIC-2E1)

4-port channelized E1/PRI interface card (FIC-4E1)

8-port channelized E1/PRI interface card (FIC-8E1)

1-port fractional E1 interface card (FIC-1E1-F)

2-port fractional E1 interface card (FIC-2E1-F)

4-port fractional E1 interface card (FIC-4E1-F)

8-port fractional E1 interface card (FIC-8E1-F)

1 port channelized T3 interface card (FIC-1CT3)

1-port channelized E3 interface card (FIC-1CE3)

1-port ATM 155 Mbps multi-mode fiber interface card (FIC-1ATM-OC3MM)

1-port ATM 155 Mbps single-mode fiber interface card (FIC-1ATM-OC3SM)

1-port ATM 155 Mbps single-mode long-haul fiber interface card (FIC-1ATM-OC3SML)

1-port 34 Mbps ATM-E3 interface card (FIC-1AE3)

1-port 44 Mbps ATM-T3 interface card (FIC-1AT3)

1-port G.SHDSL interface card (FIC-1G.SHDSL)

1-port dual-pair G.SHDSL interface card (FIC-1SHL-4W)

8-port E1 ATM inverse multiplexing interface card (FIC-IMA-8E1)

4-port E1 ATM inverse multiplexing interface card (FIC-IMA-4E1)

8-port T1 ATM inverse multiplexing interface card (FIC-IMA-8T1)

4-port T1 ATM inverse multiplexing interface card (FIC-IMA-4T1)

1-port channelized SDH/SONET interface card (FIC-1CPOS (E))

1-port channelized SDH/SONET interface card (FIC-1CPOS (T))

1-port SDH/SONET interface card (FIC-1POS)

Voice interface cards

2-port voice subscriber circuit interface card (FIC-2FXS)

2-port voice AT0 analog trunk interface card (FIC-2FXO)

2-port voice E&M analog trunk interface card (FIC-2E&M)

4-port voice subscriber circuit interface card (FIC-4FXS)

4-port voice AT0 analog trunk interface card (FIC-4FXO)

4-port voice E&M analog trunk interface card (FIC-4E&M)

1-port E1 voice interface card (FIC-1VE1)

1-port T1 voice interface card (FIC-1VT1)

2-port E1 voice interface card (FIC-2VE1)

2-port T1 voice interface card (FIC-2VT1)

2-port ISDN BRI S/T voice interface card (MIM-2BSV)

4-port ISDN BRI S/T voice interface card (MIM-4BSV)

24-port voice subscriber circuit interface card (FIC-24FXS)

24-port voice subscriber circuit interface card & 24-port voice AT0 analog trunk interface card (DFIC-24FXO24FXS)

Encryption cards

High-performance network data encryption card (FIC-HNDE)

Data encryption card

SIC/MIM/FIC Purchase Guideline

You may equip an H3C series router with appropriate interface cards or modules and are allowed to:

- Install multiple interface cards or modules of the same type on the router;
- Install an interface card or module in any slot on the router, disregarding its type.

Also, you should:

- Select interface cable appropriate to each interface card or module;
- See "Interface Card and Interface Module Purchase Guide" on page 235 for the full capacity specifications appropriate to your router model;
- See "Interface Card and Interface Module Purchase Guide" on page 235 for the interface cards and modules you are allowed to select.

The VE1 module, the VT1 module, and the 12AM module are 1U in height, each occupying two slots.

Installation/Removal of a SIC/MIM/FIC

WARNING: *H3C MSR 20/30 Series Routers do not support online insertion and removal of SICs and MIMs. Before implementing any of the following operations, wear an anti-static wrist strap and ESD-preventive glove, and make sure that the power of the Router has been turned off and the power cord has been unplugged. Otherwise, you may get an electric shock or your router may get damaged.*

CAUTION: *When replacing/installing an interface card or module, note the following*

- *Do not damage the EMI gaskets on the card/module panel. They can filter electromagnetic interference of the router.*
- *To protect the card or module against ESD damage, hold the card/module by its edge and do not touch the components on the circuit board. Put the uninstalled interface card or module on an antistatic tray.*
- *If you do not install a new card or module after removing the old one, replace the blank filter panel to keep off the dust and ensure adequate ventilation of the router.*

Installing/Removing a SIC

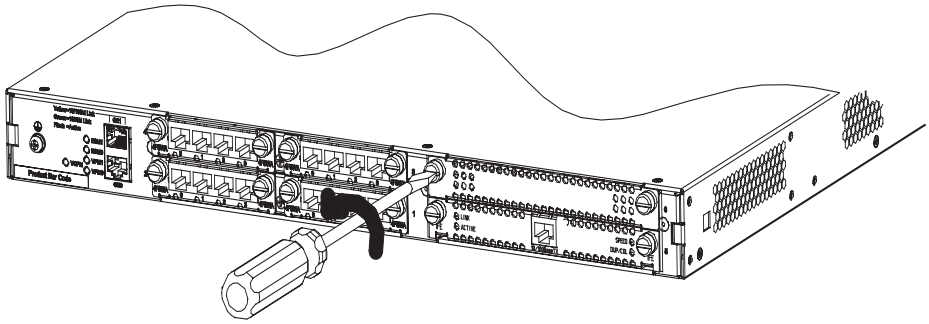
Tools required

- Flat-module screwdriver
- ESD-preventive wrist strap and ESD-preventive glove

Removing the blank filler panel in a SIC slot

Take the MSR 30 for example. Following the rotating direction shown in this figure, remove the captive screws of the blank filler panel using the flat-module screwdriver.

Figure 1 Removing the blank filler panel from a SIC slot



Installing a SIC

Follow these steps to install a SIC:

Step 1: Place the rear panel of the Router towards you;

Step 2: Turn off the power switch of the Router and unplug the power cord;

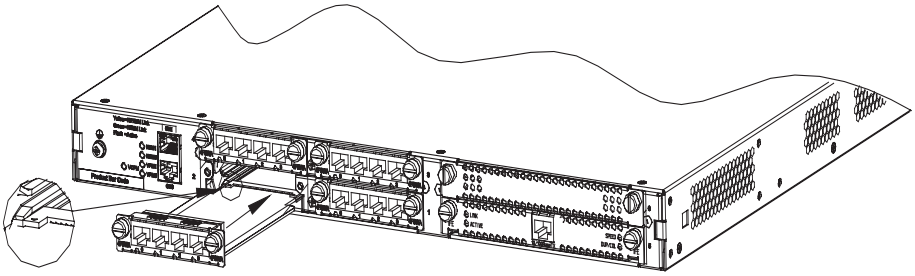
Step 3: Take out the SIC and align its remote edge with the edge of the slot on the Router's rear panel;

Step 4: Push the SIC into the Router until it closely mates with the rear panel of the Router;

Step 5: Fasten the SIC into the Router with captive screws;

Step 6: Power on the Router, and check the LEDs of the corresponding slot on the front panel: after the initialization of the SIC, ON means that the SIC is operating normally and OFF means that its Power-On Self-Test (POST) has failed. In the latter case, please contact your agent.

Figure 2 Installing SIC



Removing a SIC

Follow these steps to remove a SIC:

Step 1: Place the rear panel of the Router towards you;

Step 2: Turn off the power switch of the Router and unplug the power cord;

Step 3: Unplug all the network interface cables connected to the rear panel of the Router;

Step 4: Remove the captive screws on both sides of the SIC using the flat-module screwdriver;

Step 5: Pull the SIC outward until it is completely taken out of the Router chassis.

Installing/Removing a MIM

Tools required

- Flat-module screwdriver
- ESD-preventive wrist strap and ESD-preventive glove

Installing a MIM

Follow these steps to install a MIM:

Step 1: Place the rear panel of the Router towards you;

Step 2: Turn off the power switch of the Router and unplug the power cord;

Step 3: Select a slot and insert the MIM along the guides in the slot until it contacts the rear panel of the Router;

Step 4: Fix the MIM into the Router with captive screws;

Step 5: Power on the Router, and check the LEDs of the corresponding slot on the front panel: ON means that the MIM is operating normally and OFF means that the POST of the MIM has failed. In the latter case, please contact your agent.

Figure 3 Installing a MIM (1)

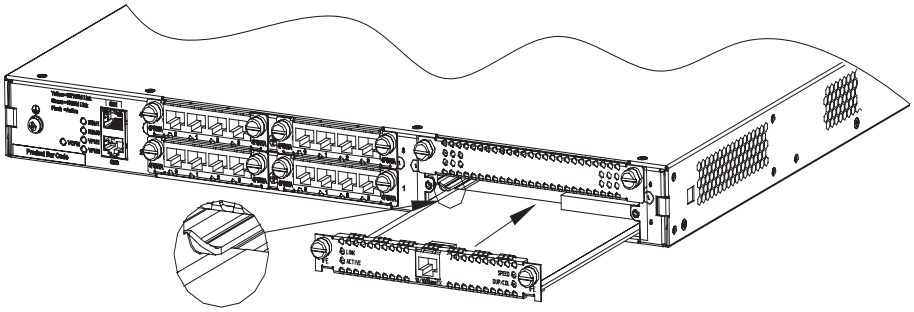
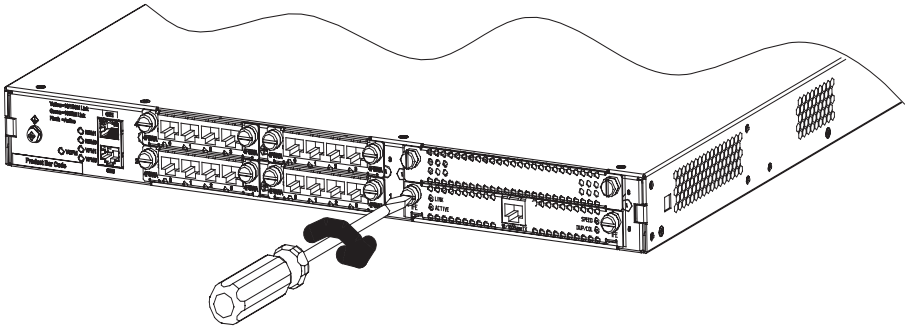


Figure 4 Installing a MIM (2)



Removing a MIM

Follow these steps to remove a MIM:

Step 1: Place the rear panel of the Router towards you;

Step 2: Turn off the power switch of the Router and unplug the power cord;

Step 3: Unplug all interface cables from the rear panel of the Router;

Step 4: Loosen the captive screws at both sides of the MIM;

Step 5: Pull the MIM towards you until it is completely separated from the bottom of the router.

Installing/Removing a FIC

CAUTION: *The EMI gaskets on the FIC panel can filter electromagnetic interference of the router. Do not damage them when uninstalling or replacing an FIC.*

If you do not install a new FIC after removing the old one, replace the blank filter panel to keep off the dust and ensure adequate ventilation of the router.

The MSR 50 series supports hot swapping. Thus, you can remove or install FICs when the router is running without disconnecting the power supply. But before that, you must first execute the ***remove slot*** *command; otherwise, unknown errors might occur. When you replace the removed FICs, you do not need to execute the* ***undo remove slot*** *command however.*

If you execute the ***remove slot*** *command inadvertently, you can cancel that operation by using the* ***undo remove slot*** *command.*

Tools required

- ESD-preventive wrist strap

Removing a FIC

Step 1: Place the router with the front panel forward.

Step 2: Remove the cables connected to the FIC.

Step 3: Loosen the captive screws at both sides of the FIC.

Step 4: Push the ejector levers at both sides of the FIC outward, pull the FIC out of the slot along the guides until disengaging it totally from the slot.

Installing a FIC

Step 1: Place the router with the front panel forward.

Step 2: Align the remote edge of the FIC with the slot edge, push it into the slot, push the ejector levers inward until it presses against the FIC panel (the angles thus formed between the FIC panel and the levers are the minimum angles).

Step 3: Fix the FIC in the chassis by fastening the captive screws.

Repeat these steps to install all the other FICs.

Troubleshooting

H3C Series Routers provide LEDs, thus facilitating you to make sure whether a SIC/MIM/FIC is properly installed by viewing their state as follows:

After the installation of a SIC/MIM/FIC, turn on the power and view the corresponding LEDs on the cover of the Router chassis: ON means that the SIC/MIM/FIC is operating normally and OFF means that the Power-On Self-Test (POST) of the SIC/MIM/FIC has failed.

If the installed SIC/MIM/FIC is in abnormal state, check that:

- Proper interface cable is used;
- The LEDs on the panel of SIC/MIM/FIC are displaying normally (see the section introducing the SIC/MIM/FIC for its LED status and description);
- The SIC/MIM/FIC accepts the configuration and works well using the **display** command.

2 SMART INTERFACE CARDS

MSR series routers adopt modular design and support a wide range of optional smart interface cards (SICs) and double smart interface cards (DSICs). A SIC interface card occupies one SIC slot of an MSR router and a DSIC interface card occupies two SIC slots of a router. The SIC/DSIC series interface cards provide abundant interfaces, such as synchronous/asynchronous serial interface, Ethernet interface, E1/T1, ISDN BRI/PRI, ADSL, audio interface, Layer 2 switching interface, and so on.

Among this series interface cards, the Layer 2 switching interface cards (SIC-4FSW and DSIC-9FSW) each have a corresponding PoE-capable one, which can provide -48 VDC power to remote powered devices (PDs, such as IP phone, WLAN AP, network camera) through straight-through cables as long as installed in a PoE router.

For H3C MSR 20-40 and MSR 30 and 50 series routers which have four SIC slots, a 4FSW/1FEF/1FEA/1GEC/1ADSL/1ADSL-I interface card can only be installed in slot 2 or slot 4.

SIC-1FEA

Introduction

1-port 10Base-T/100Base-TX Ethernet interface card (SIC-1FEA), in which FE stands for Fast Ethernet and A is used to differentiate SIC-1FEA from the 1FE module. SIC-1FEA is used to implement the communication between Routers and LANs. It supports:

- Effective transmission distance of 100 meters with category-5 twisted pair cables;
- Operating speeds of both 100 Mbps and 10 Mbps and autosensing;
- Both full duplex (in common use) and half-duplex operating modes.

For H3C MSR 20-40 and MSR 30/50 series routers, a SIC-1FEA interface card can only be installed in SLOT2 or SLOT4.

Interface Attributes

The interface attributes of SIC-1FEA are given in the following table:

Table 1 Interface attributes of SIC-1FEA

Attribute	SIC-1FEA
Connector type	RJ-45
Interface type	MDI
Number of connectors	1
Cable type	Straight-through Ethernet cable

Table 1 Interface attributes of SIC-1FEA

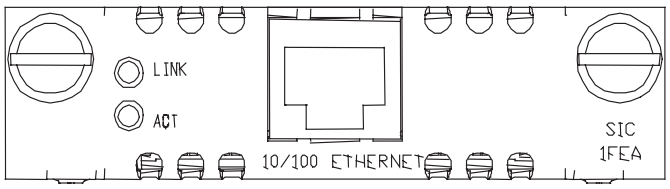
Attribute	SIC-1FEA
Operating mode	10/100 Mbps autosensing
	Full duplex/half duplex

MDI stands for Media Dependent Interface of the Ethernet. Normally, the interfaces on the network cards belong to this type. MDIX stands for Cross Media Dependent Interface, which is usually adopted on HUBs or LAN Switches.

Interface LEDs

SIC-1FEA panel is shown in the following figure:

Figure 5 SIC-1FEA panel



The status description of the LEDs on SIC-1FEA panel is listed in the following table:

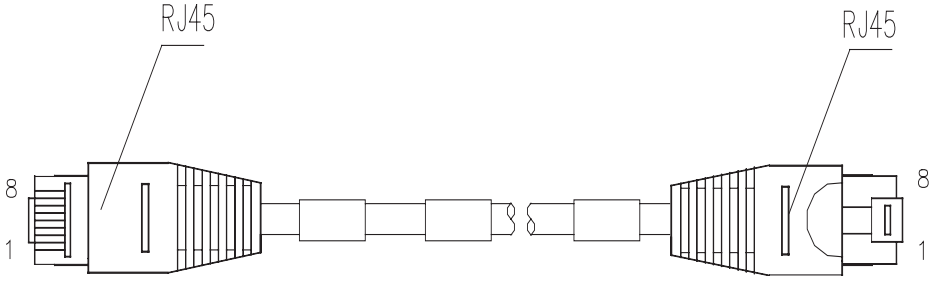
Table 2 Description of the LEDs on SIC-1FEA panel

LED	Description
LINK	OFF means no link is present;
	ON means a link is present.
ACT	OFF means no data is being transmitted or received;
	Blinking means data is being received or/and transmitted.

Interface Cable

Normally, category-5 twisted pair cable is adopted to connect the 10BASE-T /100BASE-TX Ethernet interface to the Ethernet, as shown in the following figure:

Figure 6 Ethernet cable



Ethernet cables fall into two categories: straight-through cables and crossover cables, specifically,

- Straight-through cable: the wire sequences of the twisted pair cable crimped in the RJ-45 connectors at both ends are completely the same. It is used to connect terminal devices (such as PCs, routers) to Hubs or LAN Switches.
- Crossover cable: The wire sequences of twisted pair cable crimped in the RJ-45 connectors at both ends are different. It can be used to connect two terminal devices (such as PCs and Routers). You can such kind of cables by yourself if necessary.

For the pinouts, identification and making methods of these two kinds of network cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting the Interface Cable

If the SIC has been properly installed, follow these steps to connect the interface cable:

Step 1: Connect the Ethernet port of SIC to a PC or router using a crossover cable and to a Hub or LAN Switch using a straight-through cable;

Step 2: Check the status of LINK LED on the SIC-1FEA panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

SIC-1SAE

Introduction

SIC-1SAE, 1-port enhanced high-speed synchronous/asynchronous serial interface card, provides functions similar to SA, but its serial interfaces support more protocols, such as RS449, X.21, and RS530.

Interface Attributes

The interface attributes of the SIC-1SAE are given in the following table:

Table 3 Interface attributes of the SIC-1SAE

	Description		
Attribute	**Synchronous**		**Asynchronous**
Connector	DB-28		
Number of connectors	1		
Interface standard and operating mode	V.24	V.35, RS449, X.21, RS530	RS232
	DTE, DCE	DTE, DCE	
Minimum baud rate (bps)	1200	1200	300
Maximum baud rate (bps)	64 k	2.048 M	115.2

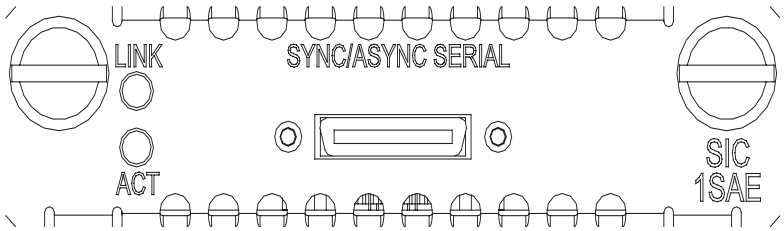
Table 3 Interface attributes of the SIC-1SAE

	Description	
Attribute	**Synchronous**	**Asynchronous**
Cable	V.24 (RS232) DTE cable	
	V.24 (RS232) DCE cable	
	V.35 DTE cable	
	V.35 DCE cable	
	X.21 DTE cable	
	X.21 DCE cable	
	RS449 DTE cable	
	RS449 DCE cable	
	RS530 DTE cable	
	RS530 DCE cable	
Supported service	1) DDN leased line	1) Dialup through modems
	2) Terminal access service	2) Backup
		3) Asynchronous leased line
		4) Terminal access

Interface LEDs

SIC-1SAE panel is shown in the following figure:

Figure 7 SIC-1SAE panel



Description of the LEDs on SIC-1SAE panel is given in the following table:

Table 4 LEDs on SIC-1SAE panel

LED	Description
LINK	OFF means no link is present;
	ON means a link is present.
ACT	OFF means no data is being transmitted or received;
	Blinking means data is being received or/and transmitted.

Interface Cable

The SIC-1SAE uses a synchronous/asynchronous serial interface cable with DB-28 connectors for connection.

Before connecting to a port on the SIC-1SAE, confirm the line properties of the interface to select an appropriate cable from the following cable options:

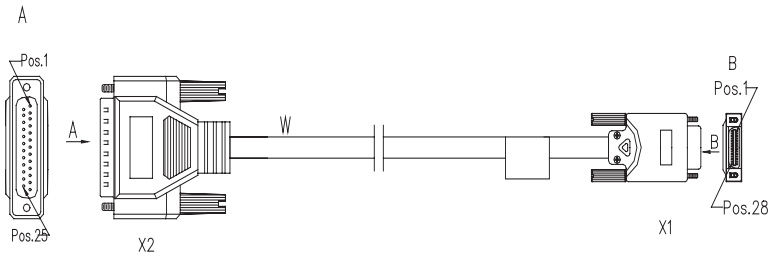
- V.24 (RS232) DTE cable: DB-25 (male) connector at the network end

- V.24 (RS232) DCE cable: DB-25 (female) connector at the network end
- V.35 DTE cable: 34PIN (male) connector at the network end
- V.35 DCE cable: 34PIN (female) connector at the network end
- X.21 DTE cable: DB-15 (male) connector at the network end
- X.21 DCE cable: DB-15 (female) connector at the network end
- RS449 DTE cable: DB-37 (male) connector at the network end
- RS449 DCE cable: DB-37 (female) connector at the network end
- RS530 DTE cable: DB-25 (male) connector at the network end
- RS530 DCE cable: DB-25 (female) connector at the network end

At one end of these cables is a DB-28 connector and at the other end is the connector that varies with the port at the network side.

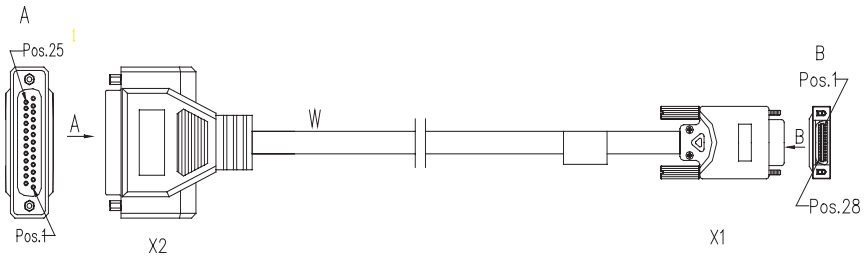
- V.24 DTE cable

Figure 8 V24 DTE cable



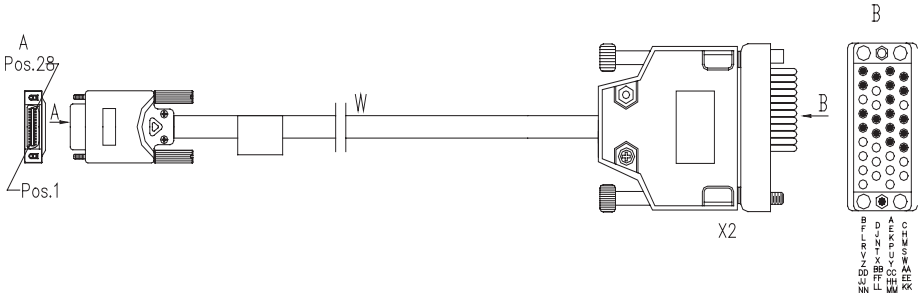
- V.24 DCE cable

Figure 9 V.24 DCE cable



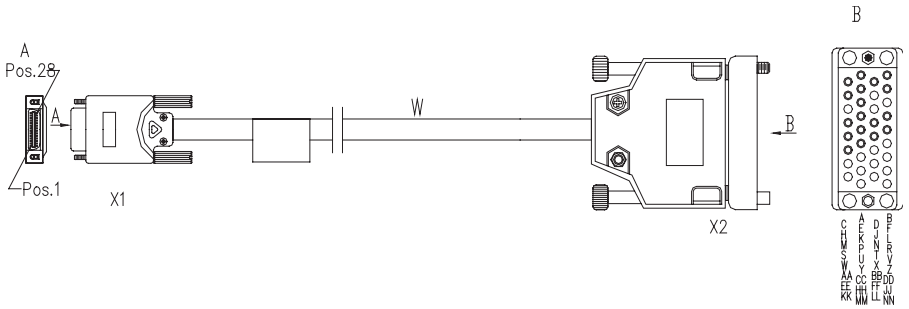
- V.35 DTE cable

Figure 10 V.35 DTE cable



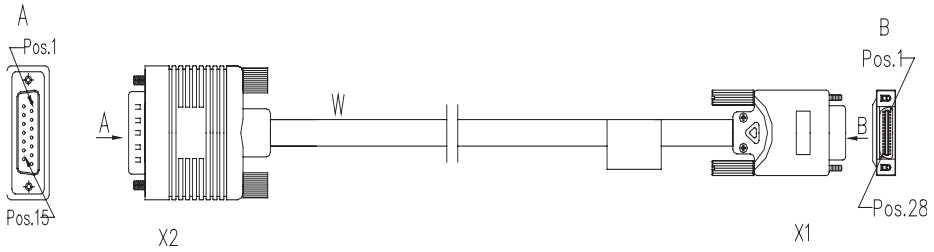
- V.35 DCE cable

Figure 11 V.35 DCE cable



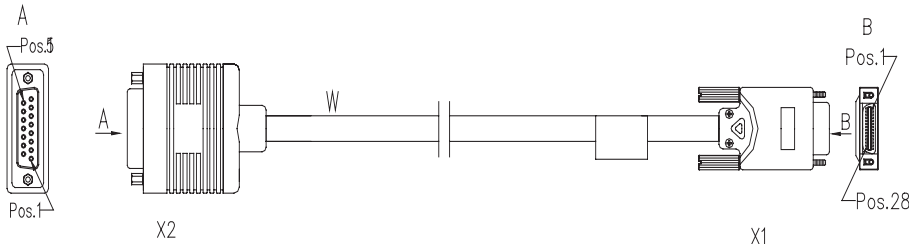
- X.21 DTE cable

Figure 12 X.21 DTE cable



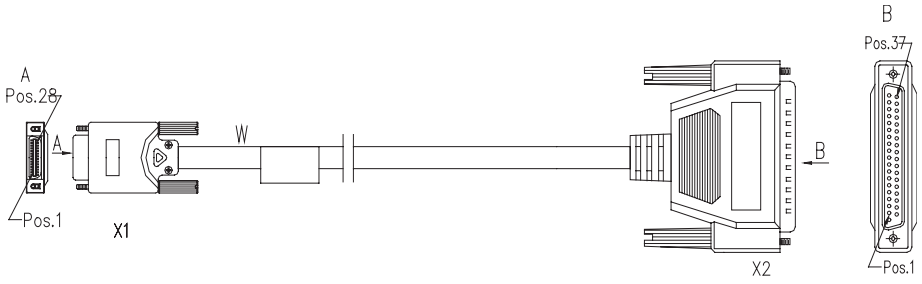
- X.21 DCE cable

Figure 13 X.21 DCE cable



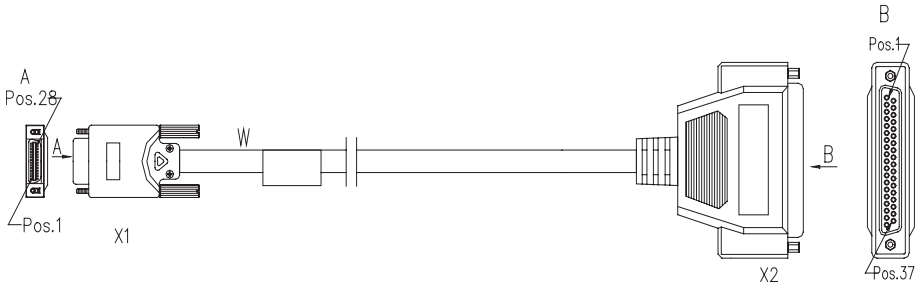
- RS449 DTE cable

Figure 14 RS449 DTE cable



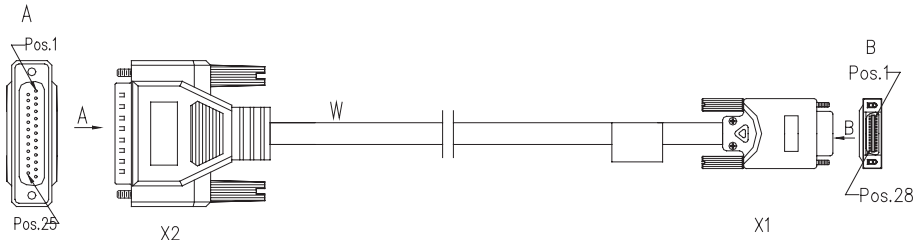
- RS449 DCE cable

Figure 15 RS449 DCE cable



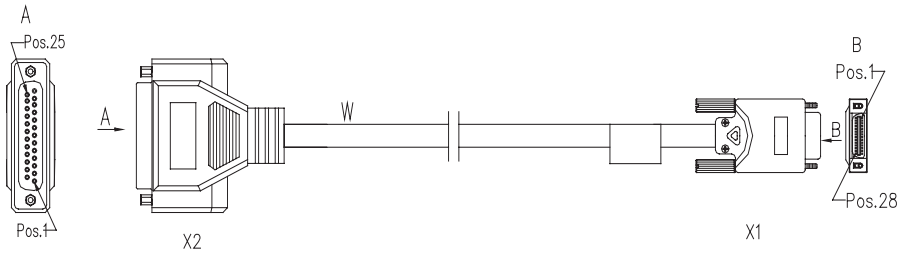
- RS530 DTE cable

Figure 16 RS530 DTE cable



- RS530 DCE cable

Figure 17 RS530 DCE cable



For the pinouts of synchronous/asynchronous serial cables (with DB-28 connectors), see *Low-End and Mid-Range Series Routers Cable Manual*.

These cables are optional items. Please select one when purchasing a SIC-1SAE card; by default, the cable is not provided.

Connecting the Interface Cable

WARNING:

- *Before plugging or unplugging the interface cable connected to the SIC-1SAE card, power off the router. Online insertion or removal tends to damage the port and even the device.*
- *Before connecting the SIC-1SAE card to a remote device, identify the type of the device, such as its synchronous/asynchronous mode and DTE/DCE mode, and the signaling criterion, baud rate and time clock required by the access device.*

Step 1: Choose a synchronous/asynchronous serial interface cable depending on the type of the interface on the remote device.

Step 2: Plug the DB-28 connector of the cable to the DB-28 port on the SIC-1SAE.

Step 3: Connect the other end of the SAE cable to:

- Port of CSU/DSU if the WAN is a DDN line.
- Serial port on an analog modem if the WAN is a dial-up line.

Step 4: Check the behavior of the LINK LED on the card panel. It is OFF when the line is faulty and signal is out of synchronization. Check the line for the cause.

SIC-1EPRI/SIC-1E1-F

Introduction

1-port channelized E1/CE1/PRI compatible interface card (SIC-1EPRI) supports:

- Transmission/Receiving and handling of E1 data streams;
- CE1 (channelized E1) access;
- ISDN PRI function;
- Remote loopback and local loopback functions, facilitating fault test and location.

It is possible to use the card for multiple purposes through different configurations.

Following are the differences between SIC-1EPRI and 1-port Fractional E1 interface card (SIC-1E1-F):

- FE1 mode of SIC-1E1-F can support only one channel bundle (the rate is n × 64kbps, n=1-31), while the 31 channels can be grouped into multiple arbitrary bundles by SIC-1EPRI;
- SIC-1E1-F does not support PRI mode.

Interface Attributes

The interface attributes of SIC-1EPRI/SIC-1E1-F are given in the following table:

Table 5 Interface attributes of SIC-1EPRI/SIC-1E1-F

Attribute	Description
Connector type	DB-15
Number of connectors	1
Interface standard	G.703, G.704
Interface rate	2.048 Mbps
Cable type	75-ohm non-balanced coaxial cable (DB-15 to BNC)
	120-ohm balanced twisted-pair cable (DB-15 to RJ-45)
	Coaxial connector, network interface connector and 75-ohm to 120-ohm adapter

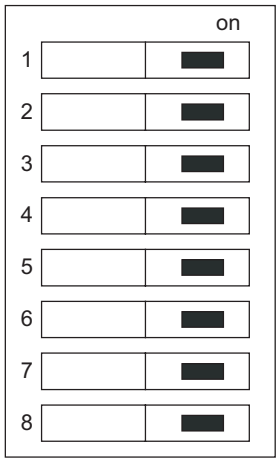
Table 5 Interface attributes of SIC-1EPRI/SIC-1E1-F

Attribute	Description
Operating mode	E1
	CE1, ISDN PRI (supported by SIC-1EPRI only)
	FE1(supported by SIC-1E1-F only)
Supported service	Backup
	Terminal access
	ISDN (supported by SIC-1EPRI only)

DIP Switch

E1/CE1/PRI interface is compatible with both 75-ohm impedance and 120-ohm impedance. The interface matches different types of impedance through an 8BIT DIP switch. By default, all the 8 positions of the DIP switch are ON, as shown in the following figure:

Figure 18 Default setting of the DIP switches



8BIT description and settings of DIP switch are given in the following table:

Table 6 Description and settings of the internal DIP switch of SIC-ERRI/SIC-1E1-F

DIP switch	Description	75-ohm impedance	120-ohm impedance
1BIT	Switch for 75-ohm/120-ohm options	ON	OFF
2BIT		ON	OFF
3BIT		ON	OFF
4BIT		ON	OFF
5BIT		ON	OFF
6BIT	Switch for RxRing grounding mode options	OFF: RxRing grounding via capacitor ON: RxRing directly grounding	-

Table 6 Description and settings of the internal DIP switch of SIC-ERRI/SIC-1E1-F

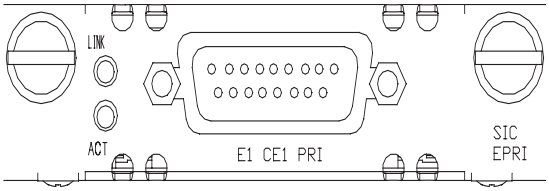
DIP switch	Description	75-ohm impedance	120-ohm impedance
7BIT	Switch for RxShield grounding options	-	ON: RxShield grounding OFF: RxShield ungrounding
8BIT	Switch for RxShield grounding options	-	OFF: RxShield grounding via capacitor ON: RxShield directly grounding

CAUTION:

- *When setting internal DIP switch, you are recommended to: turn ON all BITs from 1 to 8 when a 75-ohm cable is connected. Turn OFF all BITs from 1 to 8 when a 120-ohm cable is connected;*
- *The default configuration of internal DIP switch is that all the 8 positions of the BIT switch are ON, that is, the E1 interface impedance is 75-ohm.*

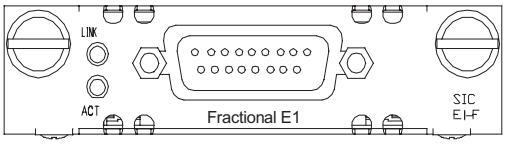
Interface LEDs SIC-1EPRI panel is shown in the following figure:

Figure 19 SIC-1EPRI panel



SIC-1E1-F panel is shown in the following figure:

Figure 20 SIC-1E1-F panel



The status description of the LEDs is given in the following table:

Table 7 Description of the LEDs on SIC-1EPRI/SIC-1E1-F panel

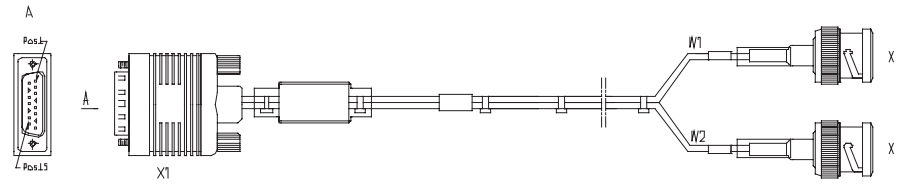
LED	Description
LINK	ON means carrier signal has been received. OFF means no carrier signal has been received.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

Interface cables for SIC-1EPRI/SIC-1E1-F are standard E1 G.703 cables. E1 G.703 cables have two types: 75-ohm non-balanced coaxial cables and 120-ohm balanced twisted pair cables, shown as follows:

- 75-ohm non-balanced coaxial cable

Figure 21 E1 G.703 75-ohm non-balanced coaxial cable

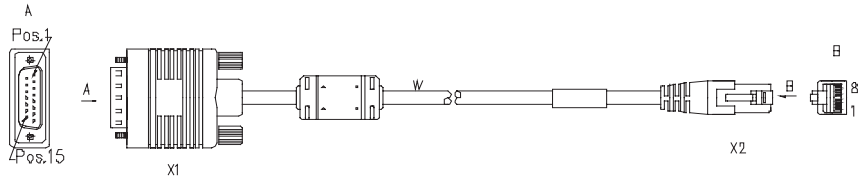


75-ohm non-balanced coaxial cable connects SIC-1EPRI/SIC-1E1-F with the DB-15 connector and the network end with the BNC connector.

A pair of coaxial connectors is available for extending the E1 cable. Both ends of the connectors are BNC receptacles that can be used to connect two 75-ohm non-balanced coaxial cables with BNC connectors.

- 120-ohm balanced twisted pair cable

Figure 22 E1 G.703 120-ohm balanced twisted pair cable



120-ohm balanced twisted pair cable connects SIC-1EPRI/SIC-1E1-F with the DB-15 connector and network end with the RJ-45 connector.

A network interface connector is available for extending the E1 cable. Both ends of the connector are RJ-45 jacks that can be used to connect two 120-ohm balanced twisted pair cables.

In addition, a 75-ohm to 120-ohm adapter is available.

For the pinouts of E1 cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *E1 cable, coaxial connector, network interface connector and 75ohm-to-120ohm adapter are optional. Please order them together with SIC-1EPRI/SIC-1E1-F. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION: *When using E1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the SIC has been properly installed, follow these steps to connect the cable:

Step 1: Check the type of E1 cable and correctly set the DIP switch (the ex-factory setting of E1/CE1/PRI interface impedance is 75-ohm);

Step 2: Connect the DB-15 connector of E1 cable to SIC-1EPRI/SIC-1E1-F;

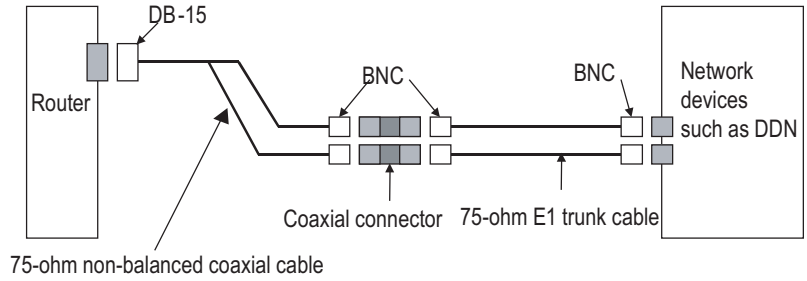
Step 3: Connect the other end of the E1 cable to the corresponding network device:

1 When the E1 cable is a 75-ohm unbalanced coaxial cable:

- Directly connect the BNC connector of the cable to the remote equipment if there is no need for extension, or
- Connect the BNC connector of the cable to the coaxial connector and the other end of the coaxial connector to the remote network equipment through a 75-ohm E1 trunk cable, if cable extension is needed.

CAUTION: *The wire marked TX in the E1 cable should be connected to the peer wire marked RX and the wire marked RX should be connected to the peer wire marked TX.*

Figure 23 Extending an E1 75-ohm non-balanced coaxial cable

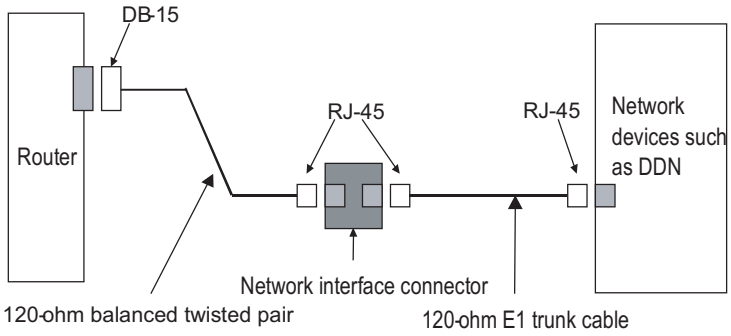


If the remote device has 120-ohm interface, it is needed to use a 75-ohm-to-120-ohm adapter or use a 120-ohm cable.

2 When the E1 cable is a 120-ohm balanced twisted pair cable:

- Directly connect the RJ-45 connector of the cable to the RJ-45 port of the remote equipment, if there is no need to extend the E1 cable, or
- Connect the RJ-45 connector of the cable to the network connector and the other end of the network connector to the network equipment through a 120-ohm E1 trunk cable, if cable extension is needed.

Figure 24 Extending an E1 120-ohm balanced twisted pair cable



Step 4: Check the status of LINK LED on the SIC-1EPRI/SIC-1E1-F panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

SIC-1TPRI/SIC-1T1-F

Introduction

1-port channelized T1/CT1/PRI compatible interface card (SIC-1TPRI) supports:

- Transmission/Receiving and handling of T1 data streams;
- CT1 (channel T1) access;
- ISDN PRI function;
- Remote loopback and local loopback, facilitating the effective and flexible debugging.

It is possible to use the card for multiple purposes through different configurations.

Following are the differences between SIC-1TPRI and 1-port Fractional T1 interface card (SIC-1T1-F):

- FT1 mode of SIC-1T1-F can support only one channel bundle (the rate is n × 56 kbps, n=1-24), while the 24 channels can be grouped into multiple arbitrary bundles by SIC-1TPRI.
- SIC-1T1-F does not support PRI mode.

Interface Attributes

The interface attributes of SIC-1TPRI/SIC-1T1-F are given in the following table:

Table 8 Interface attributes of SIC-1TPRI/SIC-1T1-F

Attribute	Description
Connector type	RJ-45
Number of connectors	1

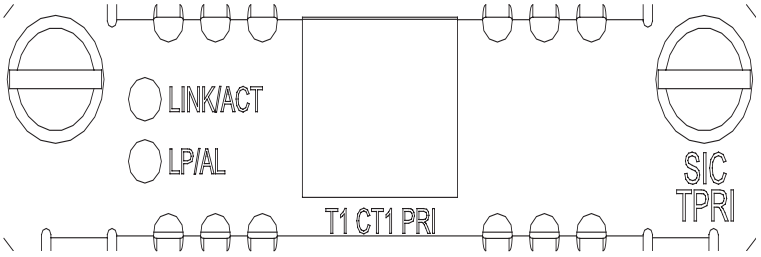
Table 8 Interface attributes of SIC-1TPRI/SIC-1T1-F

Attribute	Description
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm standard shielded network cable)
Operating mode	CT1, ISDN PRI (supported by SIC-1TPRI only)
	FT1(supported by SIC-1T1-F only)
Supported service	Backup
	Terminal access
	ISDN (supported by SIC-1TPRI only)

Interface LEDs

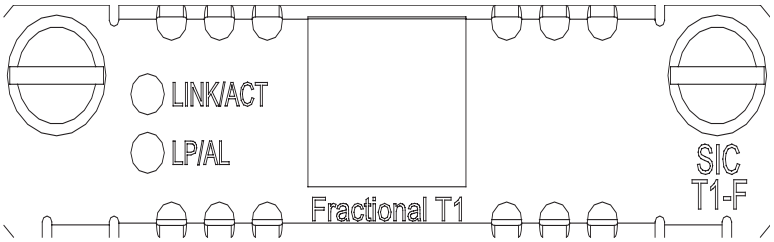
SIC-1TPRI panel is shown in the following figure:

Figure 25 SIC-1TPRI panel



SIC-1T1-F panel is shown in the following figure:

Figure 26 SIC-1T1-F panel



The status description of the LEDs is given in the following table:

Table 9 Description of the LEDs on SIC-1TPRI/SIC-1T1-F panel

LED	Description
LINK/ACT	ON means the carrier signal has been received.
	OFF means no carrier signal has been received.
	Blinking means data is being transmitted or/and received.
LP/AL	ON means the interface is in a loopback.
	Blinking means an AIS, LFA, or RAI alarm signal is present.
	OFF means no loopback or alarm is present.

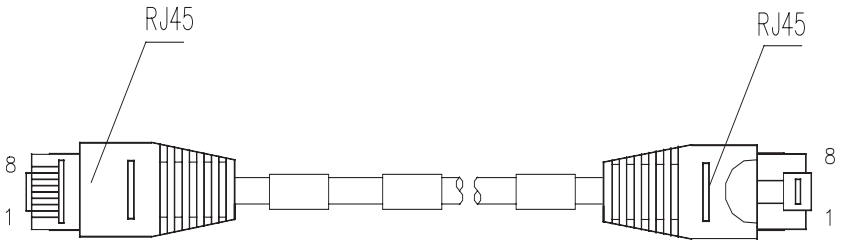
Note:

AIS = Alarm indication signal; LFA = loss of frame alignment; RAI = Remote alarm indication

Interface Cable

SIC-1TPRI/SIC-1T1-F interface cable is 100-ohm standard shielded network cable that has RJ-45 connectors at both ends. The following figure illustrates a SIC-1TPRI/SIC-1T1-F interface cable:

Figure 27 T1 cable



For the pinouts of T1 cable, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *Relevant cables are included in the standard shipment package of SIC-1TPRI/SIC-1T1-F. Please order them together with SIC-1TPRI/SIC-1T1-F. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Improper plugging is prone to impair the SIC/MIM and even damage the router.*
- *When using T1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable so as to avoid lightning more effectively.*

If the SIC has been properly installed, follow these steps to connect the cable:

Step 1: Connect one end of the T1 cable to the RJ-45 port of SIC-1TPRI/SIC-1T1-F;

Step 2: Connect the other end of the T1 cable to the relevant equipment;

Step 3: Check the status of LINK LED on the SIC-1TPRI/SIC-1T1-F panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

SIC-1AM/SIC-2AM

Introduction

1/2-port analog modem interface card (SIC-1AM/SIC-2AM) integrates the functions of asynchronous interface and external modem, that is, allowing 1/2 channel(s) of remote modem subscribers to directly access the Router. They support:

- Data rate of 56 kbps.
- Accessing and handling analog signals and transmitting the processed data to the Router host through the serial interface bus. And also, processing the data received from the host and then transmitting them to the PSTN via the telephone port.

Interface Attributes

The interface attributes of SIC-1AM/SIC-2AM are given in the following table:

Table 10 Interface attributes of SIC-1AM/SIC-2AM

Attribute	Description
Connector type	RJ11
Number of connectors	1 (SIC-1AM)
	2 (SIC-2AM)
Cable type	Telephone cable with ferrite core
Maximum speed	56 kbps
Supported standard	ITU-T V.90, V.34 (33.6 kbps), V.FC, V.32 bis, V.32, V.22 bis, V.22A/B, V.23, V.21, Bell 212A a, Bell 103.
Supported service	Modem dial-up

Interface LEDs

Figure 28 SIC-1AM panel

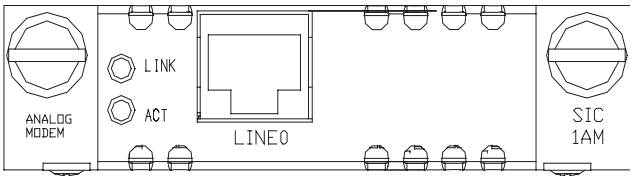


Figure 29 SIC-2AM panel

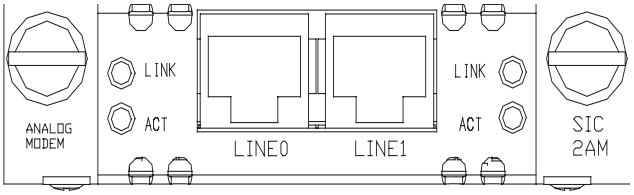


Table 11 Description of the LEDs on SIC-1AM/SIC-2AM panel

LED	Description
LINK	OFF means the link is idle. ON means the connection has been established. Blinking means the connection is being set up.
ACT	OFF means the link is idle. Blinking means data is being transmitted or received.

Interface Cable

The connection cables for SIC-1AM/SIC-2AM are telephone cables with ferrite core. Both ends of the cables are RJ11 connectors. For cable pinouts, refer to *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *Relevant cables are included in the standard shipment package of SIC-1AM/SIC-2AM.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the SIC/MIM and even damage the router.*
- *You are recommended to install a special lightning arrester on the input end of the telephone line in order to avoid the lightning effects more efficiently.*

If the SIC has been properly installed, follow these steps to connect the cable:

Step 1: Insert the end with ferrite core into one LINE port of SIC-1AM/SIC-2AM;

Step 2: Plug the other end of the cable into the telephone wall jack;

SIC-1FXS/SIC-1FXO & SIC-2FXS/SIC-2FXO

Introduction

1/2-port voice subscriber circuit interface card (SIC-1FXS/SIC-2FXS) and 1/2-port voice AT0 analog trunk interface card (SIC-1FXO/SIC-2FXO) serve to access and handle 1/2 channel(s) of analog voice signals over data communication networks. The differences between SIC-FXS and SIC-FXO are listed below:

- SIC-FXS cards are analog subscriber line cards that provide ordinary analog telephone and fax access and also can connect AT0 loop trunks of exchanges;
- SIC-FXO cards are loop trunk cards that provide access of common subscriber lines of exchanges.

CAUTION: *While using SIC-FXS/SIC-FXO, you must ensure that the H3C Routers can be connected to IP networks or other WANs.*

Interface Attributes

The interface attributes of SIC-1FXS/SIC-1FXO and SIC-2FXS/SIC-2FXO are given in the following table:

Table 12 Interface attributes of SIC-1FXS/SIC-1FXO and SIC-2FXS/SIC-2FXO

Attribute	Description
Connector type	RJ11
Number of connectors	1 (SIC-1FXS/SIC-1FXO)
	2 (SIC-2FXS/SIC-2FXO)
Interface standard	Subscriber circuit interface (SIC-1FXS/SIC-2FXS) compliant with ITU Q.512.
	Loop trunk interface (SIC-1FXO/SIC-2FXO) compliant with ITU Q.552.
	Over-current and over-voltage protection compliant with ITU K.20
Cable type	Telephone cable with ferrite core.
Dialing mode	Supports DTMF, not supports pulse dial-up.
Bandwidth	300 Hz to 3400 Hz

Interface LEDs

- SIC-1FXS/SIC-1FXO panel

Figure 30 SIC-1FXS panel

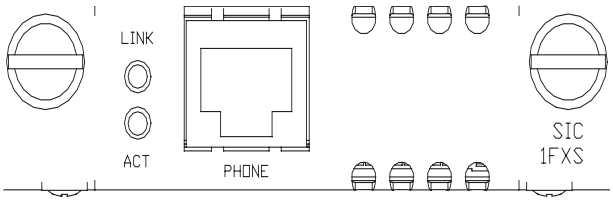
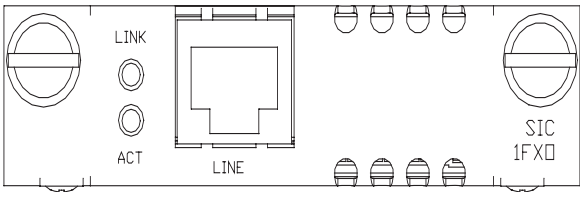


Figure 31 SIC-1FXO panel



- SIC-2FXS/SIC-2FXO panel

Figure 32 SIC-2FXS panel

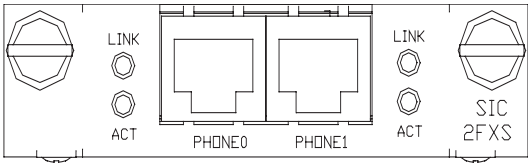
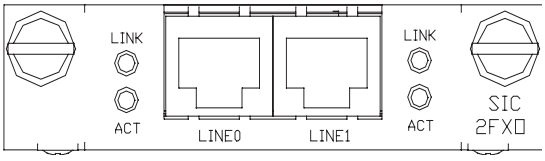


Figure 33 SIC-2FXO panel



The status description of the LEDs of SIC-1FXS/SIC-1FXO and SIC-2FXS/SIC-2FXO is shown in the following table:

Table 13 Description of the LEDs on SIC-1FXS/SIC-1FXO and SIC-2FXS/SIC-2FXO panels

LED	Description
LINK	OFF means the link is idle. ON means the link is being occupied for call connection.
ACT	OFF means the link is idle. ON means the link is being occupied for communication.

Interface Cable

Connection cables for SIC-1FXS/SIC-1FXO and SIC-2FXS/SIC-2FXO are telephone cables with ferrite core. Both ends of the cables are RJ11 connectors. For cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *The standard shipment package of SIC-1FXS/SIC-1FXO and SIC-2FXS/SIC-2FXO includes a ferrite core telephone cable.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the SIC/MIM and even damage the router.*
- *When the telephone cable is used outdoors, it is recommended that users install a special lightning arrester on the input end of the cable in order to avoid the lightning effects more efficiently.*
- *One end of the telephone cable has a ferrite core. To ensure the compatibility of the Router, users should connect the end with the ferrite core to the Router.*

If the SIC is properly installed, follow these steps to connect the cable:

Step 1: Connect the end with the ferrite core to a RJ11 port of SIC-FXS/SIC-FXO;

Step 2: Insert the other end to

- a telephone or fax or the AT0 loop trunk if a SIC-1FXS/SIC-2FXS is installed;
- a subscriber line of exchange if a SIC-1FXO/SIC-2FXO is installed;

SIC-4FSW/SIC-4FSW-PoE/DSIC-9FSW/DSIC-9FSW-PoE

Introduction

SIC-4FSW/SIC-4FSW-PoE and DSIC-9FSW/DSIC-9FSW-PoE interface cards are 4/9-port 10/100 Mbps Ethernet Layer 2 SIC interface cards that can be used on H3C MSR 20/30/50 series routers. They provide up to 4/9 10/100 Base-Tx Ethernet ports for Layer 2 and Layer 3 switching. A router installed with SIC-4FSW/DSIC-9FSW modules can work as a switching/routing integrated device on a small-sized enterprise network to connect PCs and network devices inside the

network directly. SIC-4FSW-PoE/DSIC-9FSW-PoE interface cards can supply power to powered devices (PDs) through power over Ethernet (PoE).

Functions supported by interface cards are as follows.

- Effective transmission distance of 100 meters with category-5 twisted pair cables (both crossover and straight-through);
- Effective transmission distance of 100 meters between any interfaces with category-5 twisted pair cables (both crossover and straight-through);
- Operating speeds of both 100 Mbps and 10 Mbps and autosensing;
- Both full duplex (in common use) and half-duplex operating modes.

Interface Attributes

Table 14 Interface attributes of the SIC-4FSW/SIC-4FSW-PoE/DSIC-9FSW/DSIC-9FSW-PoE

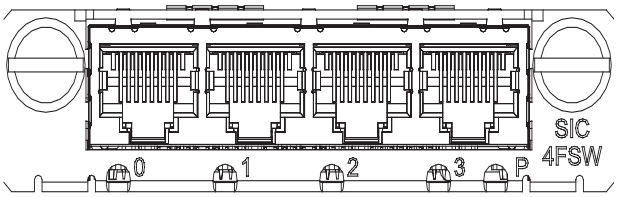
	Description	
Attribute	**SIC-4FSW/SIC-4FSW-PoE interface card**	**DSIC-9FSW/DSIC-9FSW-PoE interface card**
Connector	RJ-45	
Interface type	MDI/MDIX	
Number of connectors	Four 100 Mbps RJ45 connectors	Nine 100 Mbps RJ45 connectors
Cable	Standard (straight-through)/cross-over Ethernet cable	
Operation mode	10/100 Mbps autosensing, full/half duplex	

MDI stands for Media Dependent Interface of the Ethernet. Normally, the interfaces on the network cards belong to this type. MDIX stands for Cross Media Dependent Interface, which is usually adopted on HUBs or LAN Switches.

Interface LEDs

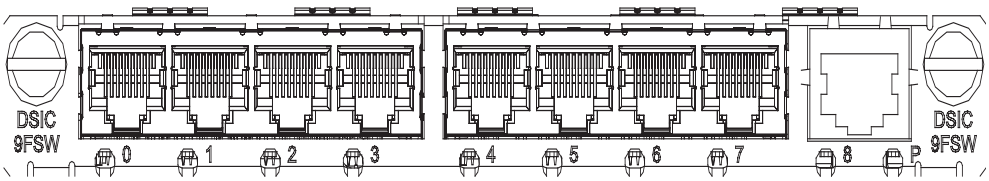
The following figure illustrates the SIC-4FSW/SIC-4FSW-PoE panel.

Figure 34 SIC-4FSW/SIC-4FSW-PoE panel



The following figure illustrates the DSIC-9FSW/DSIC-9FSW-PoE panel.

Figure 35 DSIC-9FSW/DSIC-9FSW-PoE panel



On the panel, each port corresponds with one green LED. The following table describes the LEDs on the panel.

Table 15 LEDs on the panel

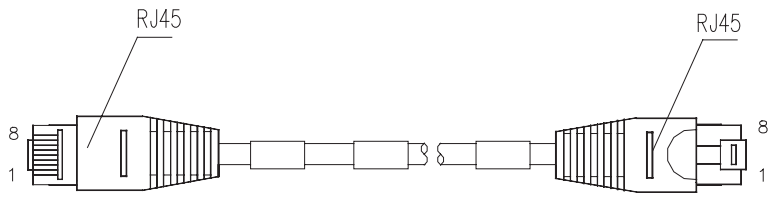
LED	Description
Steady ON	A link is present, but there is no data being transmitted or received.
OFF	No link is present.
Blinking	A link is present and there is data being transmitted and received (ACT).

In addition, there is a POE LED on each board, which is provided for the corresponding boards (SIC-4FSW-POE and DSIC-9FSW-POE) with the POE function.

Interface Cable

Normally, category-5 twisted pair cable is adopted to connect the 10BASE-T /100BASE-TX Ethernet interface to the Ethernet, as shown in the following figure:

Figure 36 Ethernet cable



Ethernet cables fall into two categories: straight-through cables and crossover cables, specifically,

- Straight-through cable: the wire sequences of the twisted pair cable crimped in the RJ-45 connectors at both ends are completely the same. It is used to connect terminal devices (such as PCs, routers) to Hubs or LAN Switches.
- Crossover cable: The wire sequences of twisted pair cable crimped in the RJ-45 connectors at both ends are different. It can be used to connect two terminal devices (such as PCs and Routers).

For the pinouts, identification and making methods of these two kinds of network cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting the Interface Cable

CAUTION: *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the interface card and even damage the router.*

If the SIC has been properly installed, follow these steps to connect the interface cable:

Step 1: Connect the Ethernet port of SIC to a PC or router using a crossover cable and to a Hub or LAN Switch using a straight-through cable;

Step 2: Check the status of LINK LED on the panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

SIC-1GEC

Introduction

1-port 10/100/1000 Mbps electrical and fiber Ethernet interface SIC card (SIC-1GEC) has the following functions:

- Receipt, transmission and processing of GE data stream;
- CE electrical and fiber interface access;
- 1000/100/10 Mbps on electrical interface;
- 1000 Mbps on fiber interface

For H3C MSR 20-40 and MSR 30/50 series routers, a SIC-1GEC interface card can only be installed in SLOT2 or SLOT4.

Interface Attributes

The attributes of SIC-1GEC interface are shown in the following table.

Table 16 Interface Attributes of the SIC-1GEC

Attribute	Description
Connector	RJ-45
Interface type	MDI
Frame format	Ethernet_II
	Ethernet_SNAP
	IEEE 802.2
	IEEE 802.3
Operation mode	10/100/1000 Mbps autosensing
	Full/half duplex
Network protocol	IP
	Novell IPX

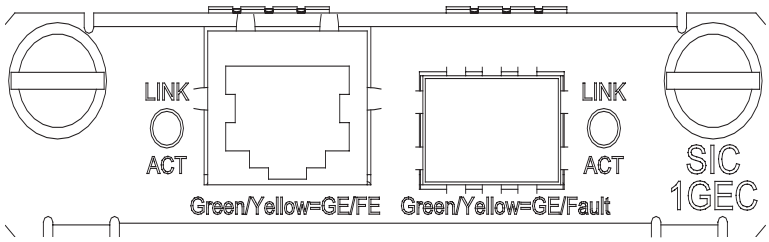
Table 17 Attributes of SFP module

SFP module name	Wavelength	Connector	Fiber specification	Maximum transmission distance
1000BASE-SX-SFP	850 nm	LC	50/125 μm multi-mode fiber	550 m (1804.5 ft.)
			62.5/125 μm multi-mode fiber	275 m (902.2 ft.)
1000BASE-LX-SFP	1310 nm		9/125 μm single-mode fiber	10 km (6.2 mi.)
1000BASE-LH-SFP				40 km (24.9 mi.)
1000BASE-ZX-LR-SFP	1550 nm			
1000BASE-ZX-VR-SFP				70 km (43.5 mi.)
1000BASE-ZX-UR-SFP				100 km (62.1 mi.)

CAUTION: *SIC-1GEC uses COMBO interface; therefore it cannot support fiber and electrical interfaces at the same time. When the router is powered on, the electrical interface takes effect by default. If you want to use a fiber interface, use a command to configure it.*

Interface LEDs The following figure illustrates the SIC-1GEC panel.

Figure 37 SIC-1GEC panel



The following table describes the electrical interface LEDs on the left of the SIC-1GEC panel.

Table 18 LEDs for the electrical interface on the left of the SIC-1GEC panel

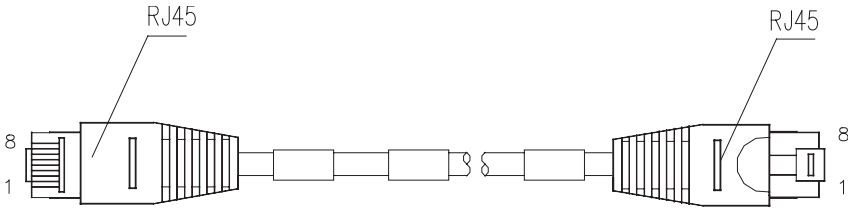
LED	Description
LINK	ON means carrier signal is received; OFF means no carrier signal is received; Green: Data is being received and transmitted at a speed of 1000 Mbps. Yellow: Data is being received and transmitted at a speed of 100/10 Mbps.
ACT	OFF: No data is being received and transmitted; Blinking: Data is being received and transmitted.

Table 19 LEDs for the fiber interface on the right of the SIC-1GEC panel

LED	Description
LINK	ON means carrier signal is received; OFF means no carrier signal is received; Green: Data is being received and transmitted at a speed of 1000 Mbps; Yellow: Fault.
ACT	OFF: No data is being received and transmitted; Blinking: Data is being received and transmitted.

Interface Cable Normally, category-5 twisted pair cable is adopted to connect the 10BASE-T /100BASE-TX Ethernet interface to the Ethernet, as shown in the following figure:

Figure 38 Ethernet cable



Ethernet cables fall into two categories: straight-through cables and crossover cables, specifically,

- Straight-through cable: the wire sequences of the twisted pair cable crimped in the RJ-45 connectors at both ends are completely the same. It is used to connect terminal devices (such as PCs, routers) to Hubs or LAN Switches.
- Crossover cable: The wire sequences of twisted pair cable crimped in the RJ-45 connectors at both ends are different. It can be used to connect two terminal devices (such as PCs and Routers).

For the pinouts, identification and making methods of these two kinds of network cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting the Interface Cable

Connecting Ethernet fiber interface cable

CAUTION: *When connecting optical fiber, note that*

- *Do not bend optical fiber with undue stress. The bend radius should be no less than 10 cm (3.9 in.);*
- *Ensure that the Tx interface and Rx interface of the module are connected correctly;*
- *Keep the sectional surface of optical fiber clean and free from dust.*

WARNING: *Laser Danger! Do not observe the optical fiber connector connected with laser; otherwise, laser may damage your eyes.*

Step 1: Plug SFP module into the corresponding SFP module slot.

Step 2: Locate the Rx optical port and Tx optical port on the module. Plug one end of optical fiber into the Rx port of the module, and the other end into the Tx port of the peer device. Plug one end of another optical fiber into the Tx port of the module, and the other end into the Rx port of the peer device;

Step 3: Check the status of LINK LED on the GBE panel: ON means the Rx link is connected and OFF means the Rx link is not connected. In the latter case, check the line.

Connecting Ethernet electrical interface cable

Step 1: (Use a crossover cable for the connection to a PC/router and straight-through cable to a Hub/LAN Switch.) Plug one end of the cable to an Ethernet port of the Router and another end to the desired peer device;

Step 2: Check the status of LINK LED on the GEC panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

SIC-1VE1

Introduction

1-port E1 voice interface card (SIC-1VE1) can handle dense voice signals in VoIP system. It provides a CE1/PRI/R2 port, allowing the access of 30 channels of voice signals.

- *When purchasing a SIC-1VE1 interface card, users should purchase a VCPM and configure a VPM based on voice traffic.*
- *No VCPM is required, but only a VPM needs to be installed on the main board when MSR 20-1x series routers need to be equipped with a SIC-1VE1 interface card.*
- *VCPM and VPM need to be installed on the main board when MSR 30 series routers need to be equipped with a SIC-1VE1 interface card.*
- *VCPM and VPM need to be installed on the MSCA card when MSR 50 series routers need to be equipped with a SIC-1VE1 interface card.*

Interface Attributes

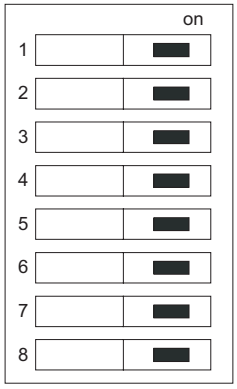
Table 20 Interface Attributes of the SIC-1VE1

Attribute	Description
Connector	DB 15
Number of connector	1
Interface standard	G.703, G.704
Interface rate	2.048 Mbps
Frame format	Ethernet_II
	Ethernet_SNAP
	IEEE 802.2
	IEEE 802.3
Cable type	75-ohm non-balanced coaxial cable
	120-ohm balanced twisted pair cable
	Coaxial connector, network interface connector and 75-ohm to 120-ohm adapter (with BNC connector)
Operation mode	CE1
	ISDN PRI (only supported by SIC-1VE1)
	R2
Services	Backup
	Terminal access
	ISDN (only supported by SIC-1VE1)

DIP Switches

CE1/PRI/R2 interface is compatible with 75-ohm and 120-ohm impedance. Matching of different impedance is implemented through an 8BIT DIP switch. By default, all the DIP switches are set to ON, as illustrated in the following figure:

Figure 39 Default setting of DIP switches



Description of DIP switch settings is given in the following table:

Table 21 Description of DIP switch settings of SIC-ERRI/SIC-1E1-F

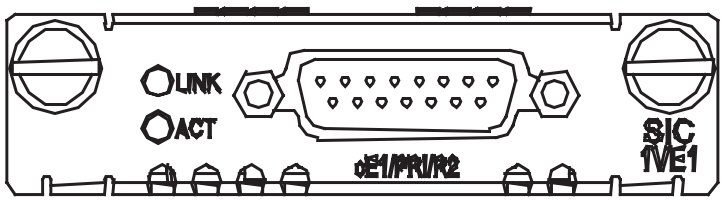
DIP	Description	Configuration of 75-ohm impedance	Configuration of 120-ohm impedance
1BIT	75-ohm/120-ohm selection switch	ON	OFF
2BIT		ON	OFF
3BIT		ON	OFF
4BIT		ON	OFF
5BIT		ON	OFF
6BIT	RxRing grounding mode selection switch	OFF: RxRing is grounded via capacitance. ON: RxRing is grounded directly.	-
7BIT	RxShield grounding mode selection switch	-	ON: RxShield is grounded. OFF: RxShield is not grounded.
8BIT	SxShield grounding mode selection switch	-	OFF: RxShield is grounded via capacitance ON: RxShield is grounded directly.

CAUTION:

- *It is recommended to select the DIP switch in this way: when connecting 75-ohm cable, flip BIT1-8 to ON, and when connecting 120-ohm cable, flip BIT1-8 to OFF.*
- *By default, all of the DIP switches are factory-configured to ON, that is, the impedance of E1 interface is 75-ohm.*

Interface LEDs The following figure illustrates the SIC-1VE1 panel.

Figure 40 SIC-1VE1 panel



The following table describes the LEDs on the SIC-1VE1 panel.

Table 22 LEDs for the electrical interface on the left of SIC-1GEC panel

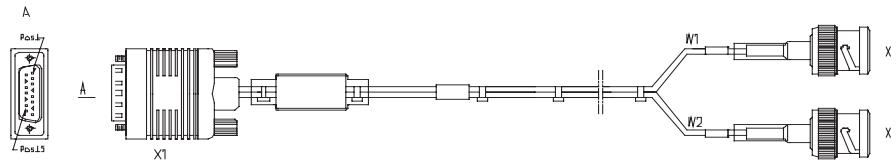
LED	Description
LINK	ON means carrier signal is received; OFF means no carrier signal is received.
ACT	OFF: No data is being received and transmitted; Blinking: Data is being received and transmitted.

Interface Cable

The interface cable of SIC-1VE1/SIC-1E1-F is a standard E1 G.703 which has two types: 75-ohm non-balanced coaxial cable and 120-ohm balanced twisted pair cable. The following figure illustrates these two types of cables.

- 75-ohm non-balanced coaxial cable

Figure 41 E1 G.703 75-ohm non-balanced coaxial cable

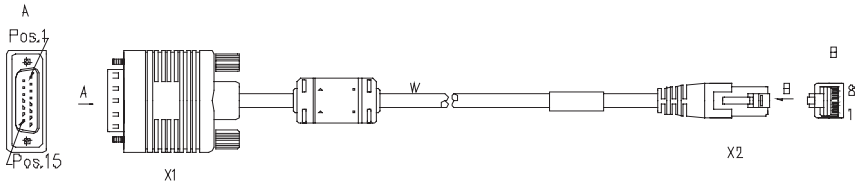


75-ohm non-balanced coaxial cable connects SIC-1VE1 with the DB-15 connector and the network end with the BNC connector.

A pair of coaxial connectors is available for extending the E1 cable. Both ends of the connectors are BNC receptacles that can be used to connect two 75-ohm non-balanced coaxial cables with BNC connectors.

- 120-ohm balanced twisted pair cable

Figure 42 E1 G.703 120-ohm balanced twisted pair cable



120-ohm balanced twisted pair cable connects SIC-1VE1 with the DB-15 connector and network end with the RJ-45 connector.

A network interface connector is available for extending the E1 cable. Both ends of the connector are RJ-45 jacks that can be used to connect two 120-ohm balanced twisted pair cables.

In addition, a 75-ohm to 120-ohm adapter is available.

For the pinouts of E1 cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *E1 cable, coaxial connector, network interface connector and 75ohm-to-120ohm adapter are optional. Please order them together with SIC-1VE1. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION: *When using E1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the SIC has been properly installed, follow these steps to connect the cable:

Step 1: Check the type of E1 cable and correctly set the DIP switch (the ex-factory setting of the interface impedance is 75-ohm);

Step 2: Connect the DB-15 connector of E1 cable to SIC-1VE1;

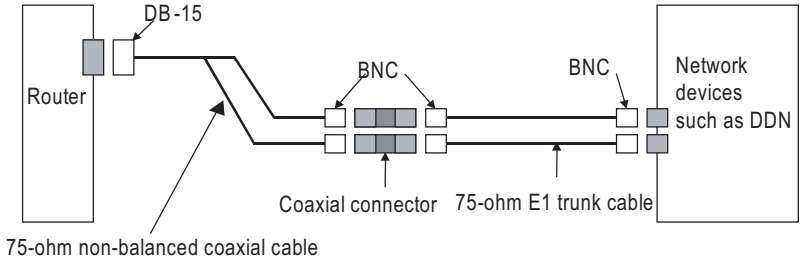
Step 3: Connect the other end of the E1 cable to the corresponding network device:

1 When the E1 cable is a 75-ohm unbalanced coaxial cable:

- Directly connect the BNC connector of the cable to the remote equipment if there is no need for extension, or
- Connect the BNC connector of the cable to the coaxial connector and the other end of the coaxial connector to the remote network equipment through a 75-ohm E1 trunk cable, if cable extension is needed.

CAUTION: *The wire marked TX in the E1 cable should be connected to the peer wire marked RX and the wire marked RX should be connected to the peer wire marked TX.*

Figure 43 Extending an E1 75-ohm non-balanced coaxial cable

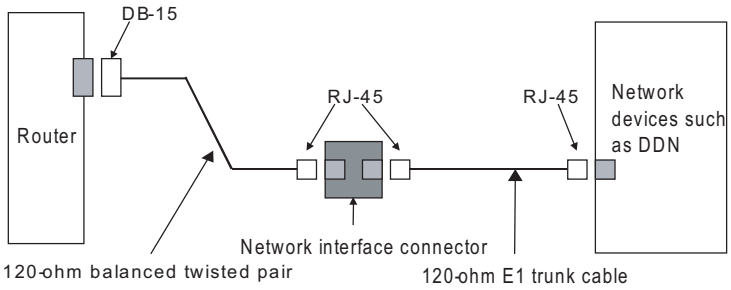


If the remote device has 120-ohm interface, it is needed to use a 75-ohm-to-120-ohm adapter or use a 120-ohm cable.

2 When the E1 cable is a 120-ohm balanced twisted pair cable:

- Directly connect the RJ-45 connector of the cable to the RJ-45 port of the remote equipment, if there is no need to extend the E1 cable, or
- Connect the RJ-45 connector of the cable to the network connector and the other end of the network connector to the network equipment through a 120-ohm E1 trunk cable, if cable extension is needed.

Figure 44 Extending an E1 120-ohm balanced twisted pair cable



Step 4: Check the status of LINK LED on the SIC-1VE1 panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

SIC-1VT1

Introduction

1-port T1 voice interface card (SIC-1VT1) can handle dense voice signals in VoIP system. It provides a CT1/PRI/R2 port, allowing the access of 23 channels of voice signals.

- *When purchasing a SIC-1VT1 interface card, users should purchase a VCPM and configure a VPM based on voice traffic.*
- *No VCPM is required, but only a VPM needs to be installed on the main board when MSR 20-1x series routers need to be equipped with a SIC-1VT1 interface card.*
- *VCPM and VPM need to be installed on the main board when MSR 30 series routers need to be equipped with a SIC-1VT1 interface card.*
- *VCPM and VPM need to be installed on the MSCA card when MSR 50 series routers need to be equipped with a SIC-1VT1 interface card.*

Interface Attributes

Table 23 Interface Attributes of the SIC-1T1-F

Attribute	Description
Connector	RJ45
Number of connector	1

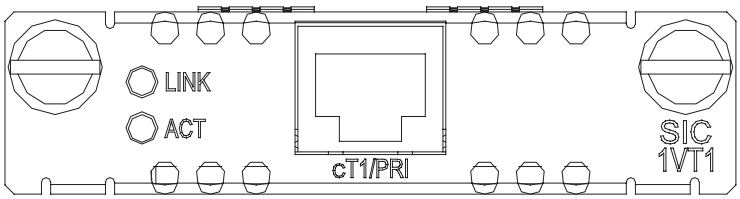
Table 23 Interface Attributes of the SIC-1T1-F

Attribute	Description
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm standard shielded cable)
Operation mode	CT1
	ISDN PRI
Services	Backup
	Terminal access
	ISDN

Interface LEDs

The following figure illustrates the SIC-1VT1 panel.

Figure 45 SIC-1VT1 panel



The following table describes the LEDs on the SIC-1VT1 panel.

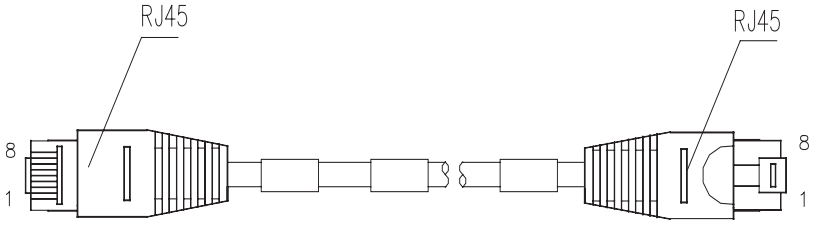
Table 24 Description on SIC-1VT1 LED

LED	Description
LINK	ON means carrier signal is received;
	OFF means no carrier signal is received.
ACT	OFF: No data is being received and transmitted;
	Blinking: Data is being received and transmitted.

Interface Cable

The interface cable of SIC-1VT1 is a standard 100-ohm standard shielding cable. The connectors on the two ends use RJ 45. The following figure illustrates this type of cable.

Figure 46 T1 cable



For the pinouts of T1 cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *The corresponding cables are not included in the standard shipment package of SIC-1VT1. Please order them together with SIC-1VT1. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the card and even damage the router.*
- *When using T1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the SIC has been properly installed, follow these steps to connect the cable:

Step 1: Plug one end of T1 cable into the RJ45 connector of SIC-1VT1.

Step 2: Connect the other end of T1 cable to the peer device;

Step 3: Check the status of LINK LED on the SIC-1VT1 panel: OFF means the link is not connected. In the latter case, check the line.

SIC-1ADSL

Introduction

SIC-1ADSL, the 1-port ADSL over PSTN interface card, provides an RJ-11 interface that can work as a WAN interface. It allows a LAN subscriber to connect to the digital subscriber's loop access multiplexer (DSLAM) at the central office over a regular analog subscriber line or telephone line. Thus, the subscriber can access the ATM/IP backbone or the Internet to enjoy services such as high-speed data communication and video on demand (VoD).

ADSL transmits data in the high frequency band above 26 kHz. Therefore, it can provide services without interfering with the voice service being provided in the low frequency band (0 to 4 kHz) on the same line. It provides downlink rates in the range 32 kbps to 8 Mbps and uplink rates in the range 32 kbps to 1 Mbps.

The SIC-1ADSL delivers these features:

- Manual ADSL line activation and deactivation, providing a convenient fault location means.
- Interface standards of G. DMT, G. Lite, and T1.413, auto-sensing.
- Trellis coding (except for G. Lite) on ADSL interfaces, enhancing the stability of ADSL connection.

For H3C MSR 20-40 and MSR 30/50 series routers, a SIC-1ADSL interface card can only be installed in SLOT2 or SLOT4.

Interface Attributes

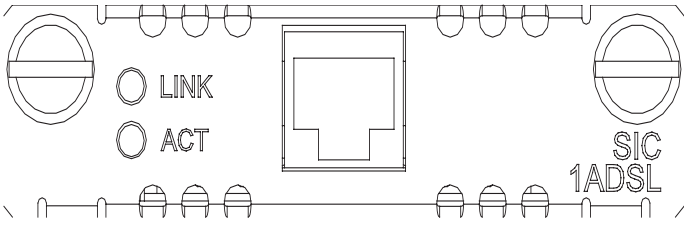
Table 25 Interface attributes of the SIC-1ADSL

Attribute	SIC-1ADSL
Connector	RJ-11
Number of connectors	1
Interface rate	■ In ADSL full rate mode (ITU-T 992.1 G.DMT/ANSI T1.413):
	8 Mbps (downlink rate)
	1024 kbps (uplink rate)
	■ In ADSL Lite mode (ITU-T 992.2 G.Lite):
	64 kbps to 1 Mbps (downlink rate)
	64 kbps to 512 kbps (uplink rate)
	■ In ADSL2+ full rate mode (ITU-T 992.5):
	24 Mbps (downlink rate)
	1024 kbps (uplink rate)
Interface standard	ITU-T 992.1 G.DMT
	ITU-T 992.2 G.Lite
	ANSI T1.413 Issue 2
	ITU-T 992.3
	ITU-T 992.5
Cable	Telephone cable
Supported service	ADSL over the regular telephone line

Interface LEDs

The following figure illustrates the SIC-1ADSL panel.

Figure 47 SIC-1ADSL panel



The following table describes the LEDs on the card panel.

Table 26 LEDs on the SIC-1ADSL panel

LED	Description
LINK	OFF means the loop is inactive.
	ON means the loop has been activated and has entered the data mode
	Blinking means the loop is being activated.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The interface cables that the SIC-1ADSL uses are regular telephone cables.

The standard equipping package of the SIC-1ADSL includes the regular telephone cable(s). You can separately order an external splitter as needed.

Connecting the Interface Cable

In G. Lite mode, no splitter is needed. You can directly connect the router to the PSTN using a telephone cable, and simply connect the phone-set in parallel with the router at the cable distribution box.

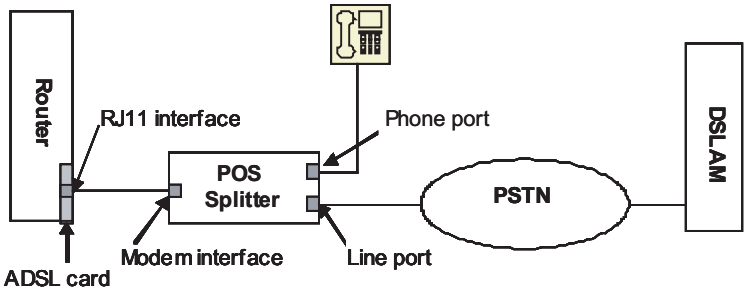
In full rate mode, a splitter is required. Follow these steps to connect the cables:

Step 1: Plug one end of a telephone cable into the ADSL port on the router, and the other end into the internal ADSL port on the splitter.

Step 2: Connect the telephone to the phone port on the splitter with another telephone cable.

Step 3: Connect the external ADSL port on the splitter to the PSTN with a third telephone cable.

Figure 48 Connecting the SIC-1ADSL



SIC-1ADSL-I

Introduction

SIC-1ADSL-I, the 1-port ADSL over ISDN interface card, uses the RJ-11 connector for the WAN interface. It allows a LAN subscriber to connect to the DSLAM at the central office over a regular analog subscriber line or telephone line. Thus, the subscriber can access the ATM/IP backbone or the Internet to enjoy services such as high-speed data communication and video on demand (VoD).

The card transmits data in the high frequency band above 138 kHz. Therefore, it can provide services on the same line without interfering with the ISDN service being provided on the same line. It provides downlink rates in the range 32 kbps to 8 Mbps and uplink rates in the range 32 kbps to 1 Mbps.

The SIC-1ADSL-I interface card delivers these features:

- Manual ADSL line activation and deactivation, providing a convenient fault location means.
- A G.992.1-compliant interface, auto-sensing.
- Trellis coding on ADSL interfaces, enhancing the stability of ADSL connection.

For H3C MSR 20-40 and MSR 30/50 series routers, a SIC-1ADSL-I interface card can only be installed in SLOT2 or SLOT4.

Interface Attributes

The following table describes the interface attributes of the SIC-1ADSL-I.

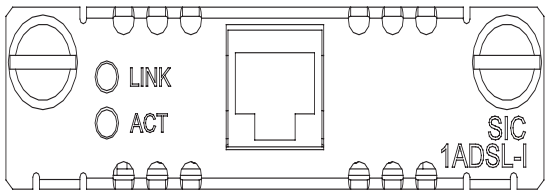
Table 27 Interface attributes of the SIC-1ADSL-I

Attribute	1ADSL-I
Connector	RJ-11
Number of connectors	1
Interface standard	ITU-T 992.1 G.DMT
	ANSI T1.413 Issue 2
	ITU-T 992.3
	ITU-T 992.5
Interface rate	Downlink: 8 Mbps
	Uplink: 1024 kbps
Interface cable	Regular telephone cable
Supported services	ADSL over ISDN

Interface LEDs

The following figures illustrate the SIC-1ADSL-I panel:

Figure 49 SIC-1ADSL-I panel



The following table describes the LEDs on the SIC-1ADSL-I panels.

Table 28 LEDs on the SIC-1ADSL-I panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.

Table 28 LEDs on the SIC-1ADSL-I panel

LED	Description
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The SIC-1ADSL-I uses regular telephone cables for connection.

The standard equipping package for the SIC-1ADSL-I includes a regular telephone cable, but the splitter needs a separate order.

Connecting the Interface Cable

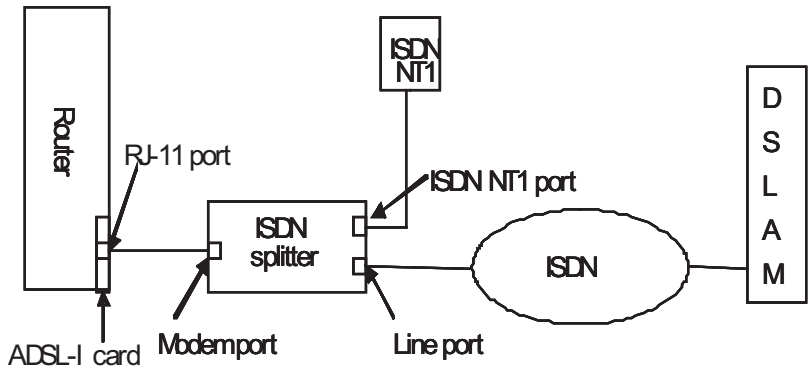
To connect the interface on the SIC-1ADSL-I card, you need to install a splitter. Follow these steps:

Step 1: Plug one end of a telephone cable into the RJ-11 port on the SIC-1ADSL-I on the router and the other end into the internal ADSL-I port on the splitter;

Step 2: Connect an ISDN NT1 to the splitter using another telephone cable.

Step 3: Connect the external ADSL-I port on the splitter to ISDN using a third telephone cable.

Figure 50 Connect the SIC-1ADSL-I



SIC-1BS/SIC-2BS&SIC-1BU/SIC-2BU

Introduction

SIC-1BS/SIC-2BS is short for 1/2-port ISDN BRI S/T interface card, which is mainly used to transceive and process of ISDN BRI S/T traffic flows. SIC-1BU/SIC-2BU is short for 1/2-port ISDN BRI U interface card, which is mainly used to transceive and process ISDN BRI U traffic flows.

Both SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU have two working modes: dial-up and leased line.

Interface Attributes

The following table describes the interface attributes of SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU.

Table 29 Interface attributes of SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU.

Attribute	Description
Connector	SIC-1BS/SIC-2BS: RJ45
	SIC-1BU/SIC-2BU: RJ45 or RJ11.
Number of connectors	1 (SIC-1BS/ SIC-1BU)
	2 (SIC-2BS/ SIC-2BU)
Cable type	Telephone cable with ferrite core
Interface standard	ITU-T I.430
	Q.921
	Q.931
Working mode	ISDN Dial-up
	ISDN leased line
Supported services	ISDN
	ISDN supplementary services
	Multi-subscriber number
	Sub-address
	Backup

Interface LEDs

The following figures illustrate the SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU panels.

Figure 51 SIC-1BS panel

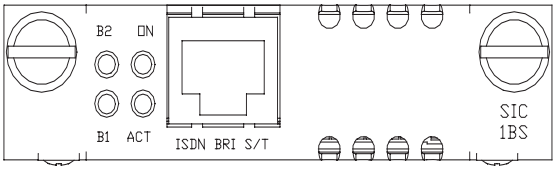


Figure 52 SIC-2BS panel

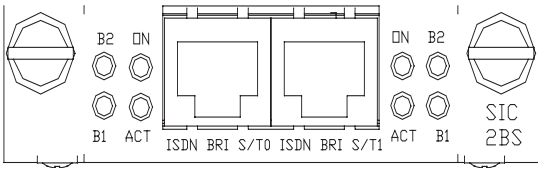


Figure 53 SIC-1BU panel

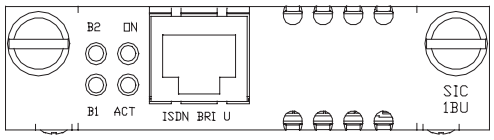
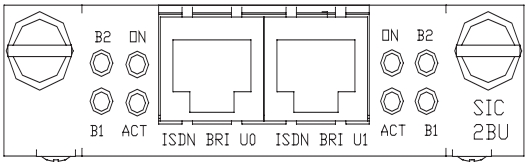


Figure 54 SIC-2BU panel



The following table describes the LEDs on SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU panels.

Table 30 LEDs on SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU panels.

LED	Description
B1	OFF indicates the B1 channel is idle.
	Blinking indicates the B1 channel is being used for data communication.
B2	OFF indicates the B2 channel is idle.
	Blinking indicates the B1 channel is being used for data communication.
ACT	OFF indicates the inactive state. Steady ON indicates the active state.
ON	OFF indicates interface card is powered off.
	ON indicates the interface card is powered on.

Interface Cable

Both SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU use the telephone cable with ferrite core.

CAUTION: *The corresponding cables of SIC-1BS/SIC-2BS and SIC-1BU/SIC-2BU are included in their standard shipment packages.*

Connecting the Interface Cable

CAUTION:

- *When connecting the interface cable, pay attention to the mark on the interface to avoid wrong insertion, which may damage the interface card or even the router host.*
- *If outdoor cabling is involved, you need to install a lightning arrester at the input end of the SIC-BU/SIC-BS interface cable to avoid lightning strike.*

After the interface card is properly installed, follow these steps to connect the cable.

Step 1: Verify the type of the ISDN line provided by your telecommunications service provider.

Step 2: Connect the cable.

- For SIC-1BS/SIC-2BS

If the line is an ISDN U-interface line, use an NT1 for conversion. Insert one end of the telephone cable with ferrite core into the BRI S/T interface of SIC-1BS/SIC-2BS, and the other end to NT1.

If the line is an ISDN S/T interface line, insert one end of the telephone cable with ferrite core to the BRI S/T interface of SIC-1BS/SIC-2BS, and connects the other end with the ISDN S/T interface line.

- For SIC-1BU/SIC-2BU interface card

If the line is an ISDN U-interface line, insert one end of the telephone cable with ferrite core into the BRI U interface of SIC-1BU/SIC-2BU, and connect the other end with the ISDN U-interface line.

If the line is an ISDN S/T interface line, contact your agent to change the interface card to SIC-1BS/SIC-2BS.

Step 3: Check the "ON" LED on the panel of the interface card. If the LED is on, the interface is powered on. If the LED is off, contact your agent for help.

SIC-1BSV/SIC-2BSV

Introduction

SIC-1BSV/SIC-2BSV is short for 1/2-port ISDN BRI S/T voice interface card, which is mainly used to process (receive/transmit and compress/decompress) the ISDN interface voice traffic. The interface(s) on the SIC-1BSV/SIC-2BSV card is (are) ITU-T I.430-compliant, adopting pseudo-ternary coding, providing 192 Kbps interface rate, and allowing the maximum transmission distance of 1 km (0.6 mi.) in point-to-point mode. In the upstream direction, the SIC-1BSV/SIC-2BSV card can be connected to a user interface on an ISDN switch to receive and decompress, compress and transmit ISDN BRI digital voice traffic. In the downstream direction, the card can be connected to a TE device to forward the voice packets from the TE device to the Internet through a WAN interface on the router, thus implementing VoIP. The card has the following features.

- A BSV interface supports two modes: user and network, respectively for connecting an ISDN network and a TE device.
- When a BSV interface works in network mode, traffic is processed as follows: The digital voice traffic received on the BSV interface is compressed and forwarded through the CPU on the main control board to a WAN interface. The IP voice traffic received on a WAN interface is forwarded through the CPU on the main control board to SIC-1BSV/SIC-2BSV, where the traffic is decompressed and sent to the TE device.
- When a BSV interface works in user mode, traffic is processed as follows: The digital voice traffic received from the B channels on the BSV interface is decompressed and forwarded through the CPU on the main control board to a local FXS or FXO analog voice interface. The voice signals received on the local FXS or FXO analog voice interface are processed by VoIP and forwarded through the CPU on the main control board to SIC-1BSV/SIC-2BSV, where the traffic is compressed and sent out of the BSV interface to the ISDN switch.
- Working in conjunction with the FXS or FXO analog voice interface modules, SIC-1BSV/SIC-2BSV provides flexibility in voice call routing.
- The ISDN BRI D channel signaling is processed separately on CPU.
- A BSV interface supports remote power supply and thus can be connected directly to an ISDN phone, saving extra power supply device.
- The SIC-1BSV/SIC-2BSV card is dedicated to voice applications, which is different from the BS interface cards where BRI data applications are supported.

Interface Attributes

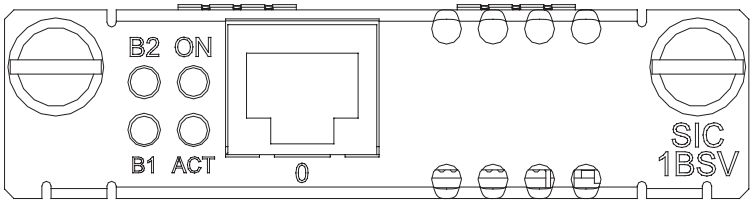
Table 31 Interface attributes of SIC-1BSV/SIC-2BSV

Attribute	SIC-1BSV	SIC-2BSV
Connector	RJ45	
Number of connectors	1	2
Interface standard	ITU-T I.430, Q.921, Q.931	
Interface rate	192 Kbps	
Cable	ISDN S interface cable	
Supported service	Voice access over ISDN S interface cable	

Interface LEDs

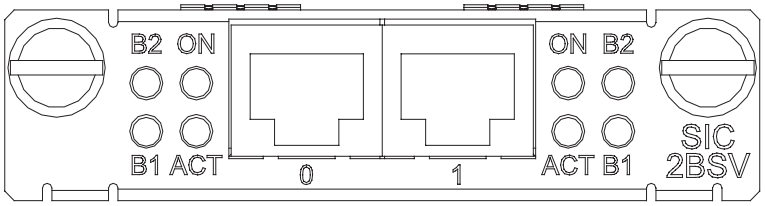
The following figure illustrates the SIC-1BSV panel.

Figure 55 SIC-1BSV panel



The following figure illustrates the SIC-2BSV panel.

Figure 56 SIC-2BSV panel



The following table describes the LEDs on SIC-1BSV/SIC-2BSV panel.

Table 32 LEDs on SIC-1BSV/SIC-2BSV panel

LED	Description
B1	Green
	Blinking indicates data is being transmitted or received on B1 channel.
B2	Green
	Blinking indicates data is being transmitted or received on B2 channel.
ACT	Yellow
	Blinking indicates the link is being activated.
	Steady ON indicates the link is active.
ON	Green, power LED.
	Steady ON indicates the card is powered on.

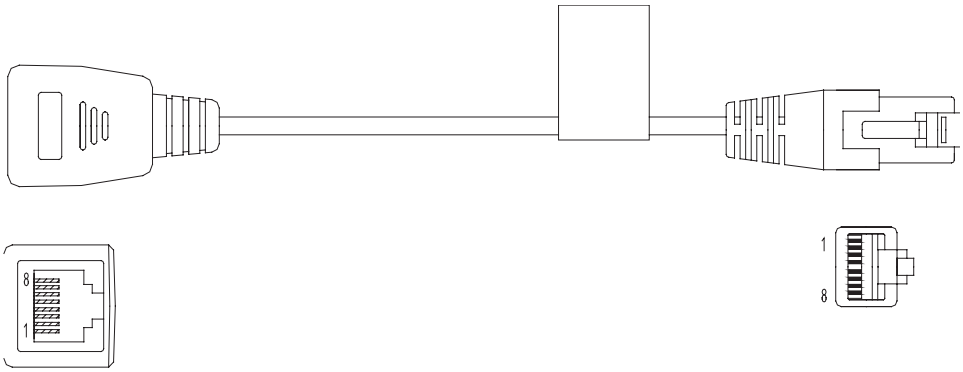
Interface Cable

When a BSV interface works in user mode, it uses a straight-through ISDN S/T interface cable for connection, with pins 3 and 6 for data transmission and pins 4 and 5 for data receiving. At both ends of the cable are RJ-45 connectors.

Figure 57 Straight-through ISDN S/T cable

When a BSV interface works in network mode, it uses a crossover ISDN S/T interface cable for connection, with pins 3 and 6 for data transmission and pins 4 and 5 for data receiving. At one end of the cable is an RJ-45 plug for connecting the SIC-1BSV/SIC-2BSV interface and at the other end of the cable is an RJ-45 receptacle for connecting a TE device.

Figure 58 Crossover ISDN S/T cable



Connecting the Interface Cable

CAUTION:

- *If outdoor cabling is involved, you need to install a lightning arrester at the input end of the ISDN BRI S/T interface cable to avoid lightning strike.*
- *When connecting the interface cable to the interface, pay attention to the mark on the interface to avoid wrong insertion, which may damage the interface card or even the router host.*

Step 1: Decide the operating mode of the BSV interface. If the interface is to be connected to an ISDN network, it should operate in user mode; if the interface is to be connected to a TE device (a digital phone or another BSV interface in user mode for example), the interface should operate in network mode.

Step 2: Connect the cable.

1 To connect the interface card to an ISDN network, identify the type of the ISDN line provided by your telecommunications service provider.

- If the line is an ISDN U-interface line, use an NT1 for conversion. Insert one end of the straight-through S/T interface cable into the S/T interface of the NT1,

and the other end into the BSV interface of the SIC-1BSV/SIC-2BSV interface card.

- If the line is an ISDN S/T interface line, directly connect the cable to the BSV interface of the SIC-1BSV/SIC-2BSV interface card.

2 To connect the interface card to a TE device, use a crossover S/T interface cable. Connect the RJ-45 plug at one end of the cable to the BSV interface, the RJ-45 receptacle to a straight-through S/T interface cable, and then the straight-through cable to the TE device.

SIC-1FEF

Introduction

SIC-1FEF is short for 1-port 100 Mbps fiber Ethernet interface card, where FE is short for Fast Ethernet and F for fiber, indicating an optical fiber interface. SIC-1FEF is used for the communication between the router and LAN.

SIC-1FEF supports:

- Five types of SFP removable optical interface modules: multimode short-haul (850 nm), single-mode medium-haul (1310 nm), single-mode long-haul (1310 nm), single-mode long-haul (1550 nm), and single-mode ultra-long haul (1550 nm).
- 1000 Mbps interface rate
- Full duplex

Interface Attributes

The following table describes the interface attributes of the SIC-1FEF.

Table 33 Interface attributes of SIC-1BSV/SIC-2BSV

Attribute		Description				
Number of connectors		1				
Connector		SFP/LC				
Interface standard		802.3, 802.3u, and 802.3ab				
Transmitting optical power	Type	Multimode short-haul (850 nm) Optical interface module	Single-mode medium-haul (1310 nm) Optical interface module	Long-haul (1310 nm) Optical interface module	Long-haul (1550 nm) Optical interface module	Ultra-long haul (1550 nm) Optical interface module
	Min.	-9.5 dBm	-9 dBm	-2 dBm	-4 dBm	-4 dBm
	Max.	0 dBm	-3 dBm	5 dBm	1 dBm	2 dBm
Receiver sensitivity		-17 dBm	-20 dBm	-23 dBm	-21 dBm	-22 dBm
Central wavelength		850 nm	1310 nm	1310 nm	1550 nm	1550 nm
Fiber type		62.5/125 μm multimode	9/125 μm single mode	9/125 μm single mode	9/125μm single mode	9/125μm single mode
Max. transmission segment		0.55 km (0.34 mi.)	10 km (6.21 mi.)	40 km (24.86 mi.)	40 km (24.86 mi.)	70 km (43.50 mi.)

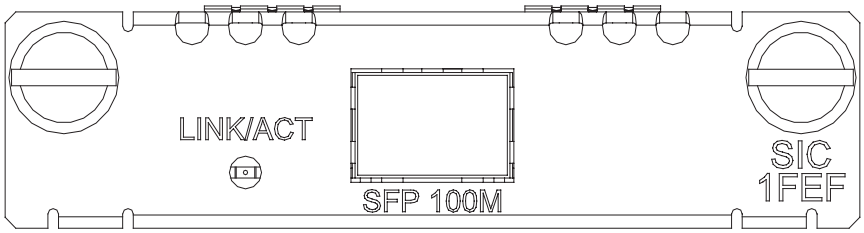
Table 33 Interface attributes of SIC-1BSV/SIC-2BSV

Attribute	Description
Operating mode	100 Mbps
	Full duplex

Interface LEDs

The following figure illustrates the SIC-1FEF panel:

Figure 59 SIC-1FEF panel



The following table describes the LEDs on the SIC-1FEF panel:

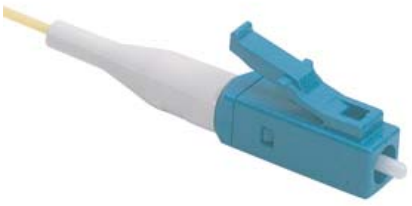
Table 34 LEDs on SIC-1FEF panel

LED	Status	Description
LINK/ACT	OFF	No link is present.
	Steady green	The SFP optical module has established a 100 Mbps link.
	Blinking green	Data is being received and transmitted.
	Steady yellow	Information detection failed.

Interface Cable

For SIC-1FEF, select fibers depending on the type of the installed SFP removable optical module. As the interfaces provided by these SFP modules use LC-type fiber-optic connectors, you must use fibers with LC connectors for them.

Figure 60 LC-type fiber-optic connector



LC-type fiber-optic connectors are compact fiber-optic connectors developed by Lucent. Push an LC-type fiber-optic connector to connect it to the optical module and press the button on the connector to remove it.

The fibers are provided depending on the purchased SFPs. Therefore, please provide information on the SFPs when purchasing interface cards; by default, the fibers are not provided.

Connecting the Interface Cable

CAUTION: *When connecting the optical fiber, observe the following*

- *Do not over-bend the optical fiber. Its curvature radius must be no less than 10 cm (3.9 in).*
- *Ensure that the Tx and Rx ends are correctly connected.*
- *Ensure that the fiber ends are clean.*

WARNING: *Laser danger: Invisible laser radiation may be emitted from the fiber-optic ports which are connected to lasers. To protect your eyes against radiation harm, never stare into an open fiber-optic port.*

Step 1: Insert the SFP optical module into its corresponding slot.

Step 2: Locate the Rx and Tx ports of the SIC-1FEF interface. Connect them to another device with two optical fibers: Rx to Tx and Tx to Rx.

Step 3: Power on the router and check the behavior of the LINK LED on the SIC-1FEF panel. ON means an Rx link is present and OFF means the opposite. In the latter case, check the line status.

SIC-8AS

Introduction

SIC-8AS, the 8-port asynchronous serial interface card, is mainly used to transceive and process the asynchronous data streams.

SIC-8AS has these features:

- Each asynchronous serial port provides a rate up to 115.2 Kbps.
- Supports the terminal access service and asynchronous dedicated line.
- Serves as the small-/medium-sized ISP dial-up access server when an asynchronous serial port is used for dial-up.

Interface Attributes

The following table describes the interface attributes of SIC-8AS.

Table 35 Interface attributes of SIC-8AS

Attribute	Description
Connector	DB60
Number of connectors	1
Interface cable	Customized cable with 8-port RJ-45 connector
Interface standard	RS232
Minimum baud rate	300 bps
Maximum baud rate	115.2 Kbps

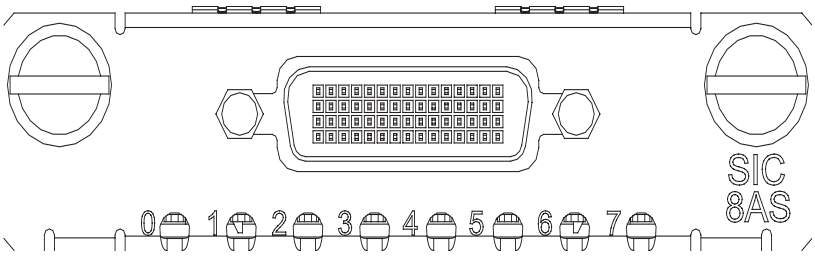
Table 35 Interface attributes of SIC-8AS

Attribute	Description
Supported services	Modem dial-up; Backup; Terminal access service; Asynchronous dedicated line

Interface LEDs

The following figure illustrates the SIC-8AS front panel:

Figure 61 SIC-8AS front panel



The following table describes the LEDs on the SIC-8AS panel:

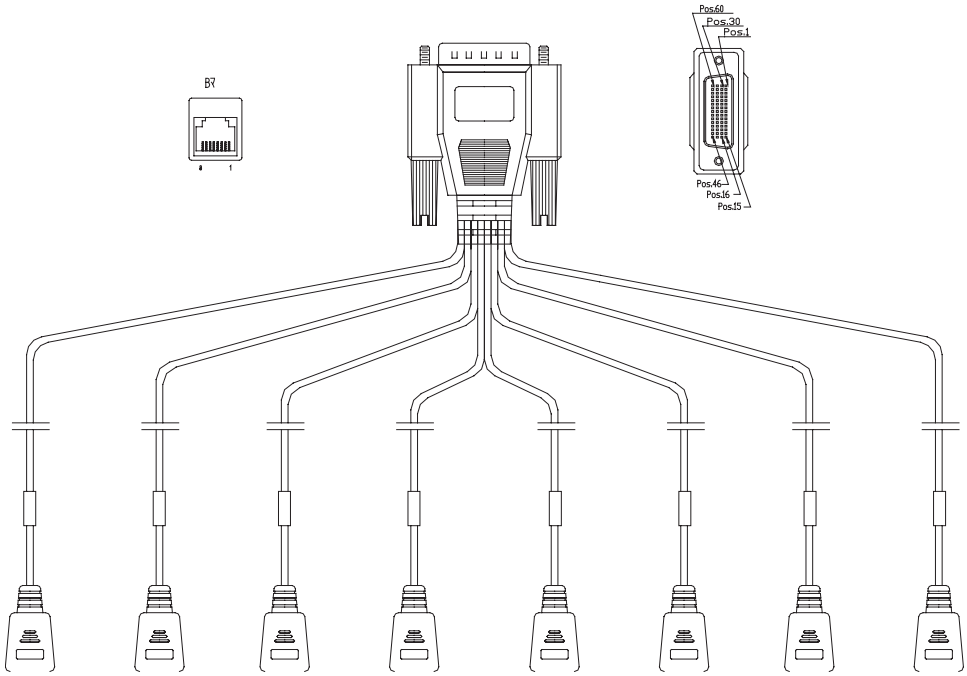
Table 36 LEDs on SIC-8AS panel

LED	Description
LINK/ACT	OFF means no link is present; ON means a link is present. Blinking means data is being received or/and transmitted.

Interface Cable

The SIC-8AS uses the customized cable, which is illustrated by the following figure:

Figure 62 Customized cable



CAUTION: *This customized cable is optional. You need to order it when you purchase a SIC-8AS card.*

Connecting the Interface Cable

WARNING: *Do not plug or unplug the interface cable of the SIC-8AS card when the router is running; otherwise, the router and the ports may be damaged.*

Step 1: Connect the power cable and telephone cable to the Modem or terminal device.

Step 2: Plug one end of the AUX cable, the DB60 connector, to the router and fasten the screws on the connector, and plug the other end of the cable to the Modem or terminal.

Step 3: Check the LINK/ACT LED status on the SIC-8AS panel: ON means the link is present; OFF means no link is present. If the LED is OFF, check the line.

3 MULTIFUNCTIONAL INTERFACE MODULES

For the modular MSR series routers, a wide range of optional MIM/DMIM multifunctional interface modules are available, which provide abundant interfaces, such as synchronous/asynchronous serial interface, Ethernet interface, E1/T1, ISDN BRI/PRI, audio interface, Layer 2 switching interface, and so on.

Among the Layer 2 switching interface cards, neither the XMIM-16FSW nor the XMIM-24FSW supports the PoE function, while the MIM-16FSW and the DMIM-24FSW support the PoE function to provide -48 VDC power to remote PDs (such as IP phone, WLAN AP, network camera) through straight-through network cables as long as installed in a PoE router.

MIM-1FE/MIM-2FE/MIM-4FE Modules

Introduction

1/2/4-port 10/100Base-TX Fast Ethernet interface module (MIM-1FE/MIM-2FE/MIM-4FE) serves to complete communications between routers and LANs.

FE modules support:

- Effective transmission distance of 100 meters with category-5 twisted pair cables;
- Operating speeds of both 100 Mbps and 10 Mbps and autosensing;
- Both full duplex (in common use) and half-duplex operating modes.

Interface Attributes

The interface attributes of MIM-1FE/MIM-2FE/MIM-4FE are given in the following table:

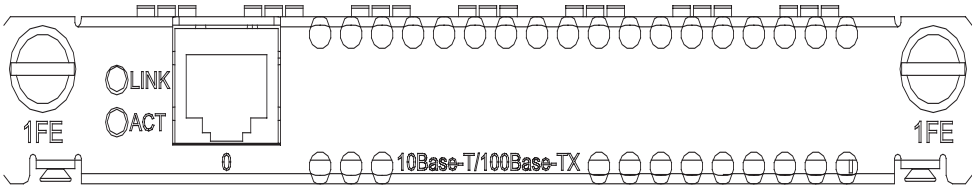
Table 37 Interface attributes of MIM-1FE/MIM-2FE/MIM-4FE

	Description		
Attribute	**MIM-1FE module**	**MIM-2FE module**	**MIM-4FE module**
Connector	RJ-45		
Type of interface	MDI		
Number of connectors	1	2	4
Cable type	Straight-through Ethernet cable		
Operating mode	Full duplex/ half-duplex 10/100 Mbps autosensing		

Interface LEDs

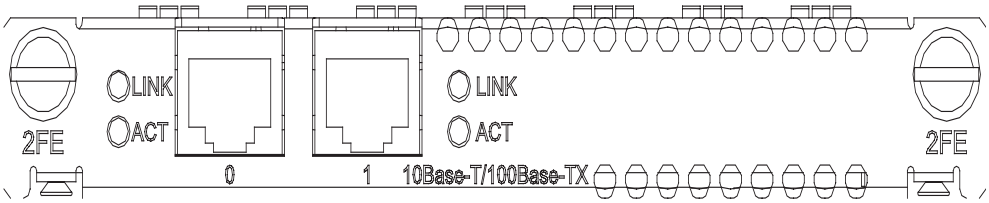
MIM-1FE panel is shown in the following figure:

Figure 63 MIM-1FE panel



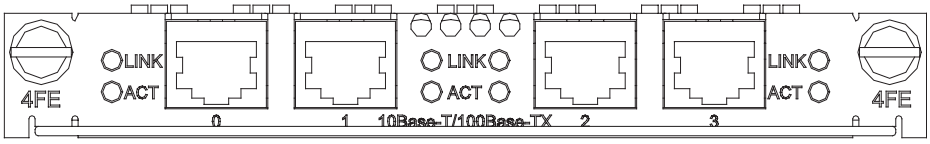
MIM-2FE panel is shown in the following figure:

Figure 64 MIM-2FE panel



MIM-4FE panel is shown in the following figure:

Figure 65 MIM-4FE panel



The following table describes the LEDs on the MIM-1FE/MIM-2FE/MIM-4FE panel:

Table 38 Description of the LEDs on the MIM-1FE/MIM-2FE/MIM-4FE panel

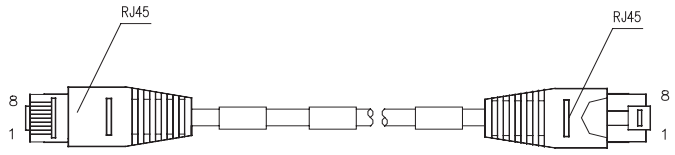
LED	Description
LINK	OFF means the Ethernet link is not connected. ON means the link is connected.
ACTIVE	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

Ethernet cable

Ethernet cables for FE modules are category 5 twisted pair cables with RJ-45 connectors (see Figure 66). Pins 1 and 2 of the interface are for data transmission, and Pins 3 and 6 are for data receiving.

Figure 66 Ethernet cable



Making Ethernet cable

Category 5 twisted pairs are adopted for making Ethernet cables. Each category 5 twisted pair is composed of 8 cores that are identified and grouped by color of insulation sheath. Usually a solid color wire and the white/solid color wire for it are in pairs. But sometimes, wires are also paired by color dots.

Ethernet cables fall into two categories: straight-through cables and crossover cables, specifically,

- Straight-through cable: The sequences of the twisted pairs crimped by RJ-45 connectors at both ends are the same. It is used for the connection between a terminal device (e.g., PC and router) and a Hub/LAN Switch. The cables delivered with the Router are straight-through cables.
- Crossover cable: The sequences of the twisted pairs crimped by RJ-45 connectors at both ends are different. It is used for the connection between terminal devices (e.g., PC and router).And it can be made by the user.

For the pinouts of straight-through Ethernet cable and crossover Ethernet cable, see *Low-End and Mid-Range Series Routers Cable Manual.*

Connecting the Interface Cable

Step 1: (Use a crossover cable for the connection to a PC/router and straight-through cable to a Hub/LAN Switch.) Plug one end of the cable to an Ethernet port of the Router and another end to the desired peer device;

Step 2: Check the status of LINK LED on the FE module panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

CAUTION: *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the SIC/MIM and even damage the Router.*

MIM-1GBE/MIM-2GBE Module

Introduction

1-port 10Base-T/100Base-TX/1000Base-T Ethernet electrical interface module (MIM-1GBE) and 2-port 10Base-T/100Base-TX/1000Base-T Ethernet electrical interface module serve to complete the communication between a router and a LAN.

The GBE (Gigabit Ethernet) supports:

- Transmission distance up to 100 meters over the category 5 twisted-pair cable;

- Operating speeds of 1000 Mbps, 100 Mbps, and 10 Mbps, as well as auto-sensing;
- Half-duplex/full duplex, autosensing

Interface Attributes

The interface attributes of MIM-1GBE/MIM-2GBE are given in the following table:

Table 39 Interface attributes of MIM-1GBE/MIM-2GBE

	Description	
Attribute	**MIM-1GBE**	**MIM-2GBE**
Connector	RJ-45	
Number of connectors	1	2
Interface type	MDI/MDIX	
Interface standard	802.3, 802.3u, 802.3ab	
Cable type	Ethernet cable	
Operating mode	10/100/1000 Mbps auto-sensing Half-duplex/full duplex, autosensing	

Interface LEDs

MIM-1GBE/MIM-2GBE panel is shown in the following figure:

Figure 67 MIM-1GBE panel

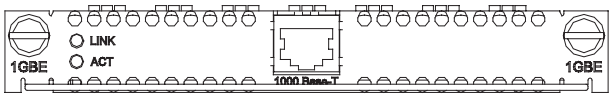
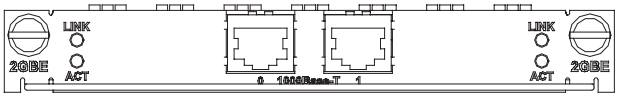


Figure 68 MIM-2GBE



The following table describes the LEDs on the MIM-1GBE/MIM-2GBE panel.

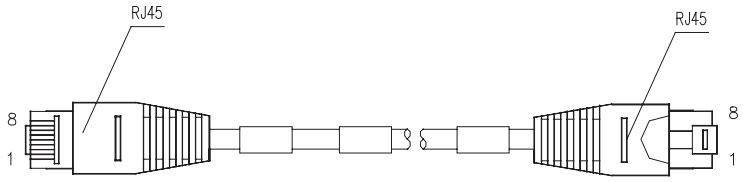
Table 40 Description of the LEDs on the MIM-1GBE/MIM-2GBE panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

MIM-1GBE/MIM-2GBE uses both crossover and straight-through cables for connection.

Figure 69 Ethernet cable



For the pinouts of Ethernet cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting the Interface Cable

To connect a PC or another router, use a crossover cable; to connect a LAN Switch or HUB, use a straight-through cable.

Step 1: Connect one end of the cable to the Ethernet port and the other end to the peer device;

Step 2: Check the status of LINK LED on the 1GBE panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

MIM-1GEF/MIM-2GEF Module

Introduction

MIM-1GEF/MIM-2GEF is short for 1/2-port 1000Base-SX/1000Base-LX GE fiber interface module, where GE is short for Gigabit Ethernet and F for fiber, indicating optical fiber interface. MIM-1GEF/MIM-2GEF is used for the communication between router and LAN.

MIM-1GEF/MIM-2GEF supports:

- Five types of 1000Base-LX/1000Base-SX SFP removable modules: multi-mode short-haul (850 nm), single mode medium-haul (1310 nm), single mode long-haul (1310 nm), single mode long-haul (1550 nm), and single mode ultra-long haul (1550 nm)
- 1000 Mbps interface rate
- Full duplex

Interface Attributes

The interface attributes of MIM-1GEF/MIM-2GEF are given in the following table:

Table 41 Interface attributes of MIM-1GEF/MIM-2GEF

	Description	
Attribute	**MIM-1GEF**	**MIM-2GEF**
Number of interfaces	1	2
Connector	SFP/LC	
Interface standard	802.3, 802.3u, 802.3ab	

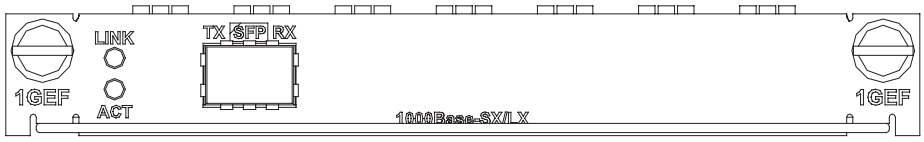
Table 41 Interface attributes of MIM-1GEF/MIM-2GEF

Attribute		Description				
		MIM-1GEF	MIM-2GEF			
Transmitting optical power	Type	Multi-mode short-haul (850 nm)	Single mode medium-haul (1310 nm)	Long-haul (1310 nm)	Long-haul (1550 nm)	Ultra-long (1550 nm)
	Min.	-9.5 dBm	-9 dBm	-2 dBm	-4 dBm	-4 dBm
	Max.	0 dBm	-3 dBm	5 dBm	1 dBm	2 dBm
Receiver sensitivity		-17 dBm	-20 dBm	-23 dBm	-21 dBm	-22 dBm
Central wavelength		850 nm	1310 nm	1310 nm	1550 nm	1550 nm
Fiber type		62.5/125 μm multi-mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode
Max. transmission segment		0.55 km (0.34 mi.)	10 km (6.21 mi.)	40 km (24.86 mi.)	40 km (24.86 mi.)	70 km (43.50 mi.)
Operating mode		1000 Mbps Full duplex				

Interface LEDs

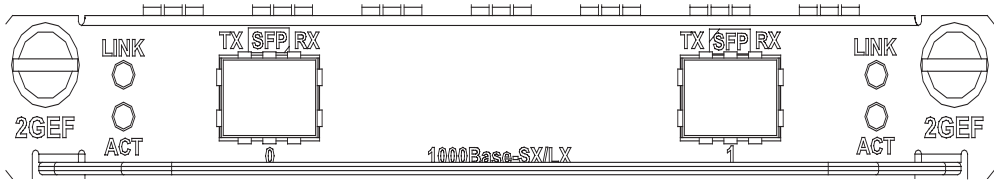
MIM-1GEF panel is shown in the following figure:

Figure 70 MIM-1GEF panel



MIM-2GEF panel is shown in the following figure:

Figure 71 MIM-2GEF panel



The following table describes the LEDs on the MIM-1GEF/MIM-2GEF panel.

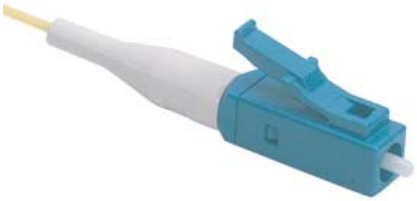
Table 42 LEDs on the MIM-1GEF/MIM-2GEF panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

For MIM-1GEF/MIM-2GEF, select fiber-optic depending on the type of the installed 1000Base-SX/1000 Base-LX SFP. As the interfaces provided by these SFP modules use LC-type fiber-optic connectors, you must use fibers with LC connectors for them.

Figure 72 LC-type fiber-optic connector



- *LC-type fiber-optic connectors were compact fiber-optic connectors developed by Lucent.*
- *The fibers are provided depending on the purchased SFPs. Therefore, please provide information on the SFPs when purchasing FICs; by default, the fibers are not provided.*

Connecting the Interface Optic Fiber

CAUTION: *When connecting the optical fiber, observe the following*

- *Do not over-bend the optical fiber. Its curvature radius must be no less than 10 cm (3.9 in).*
- *Ensure that the Tx and Rx ends are correctly connected.*
- *Ensure that the fiber ends are clean.*

WARNING: *Laser danger: Invisible laser radiation may be emitted from the fiber-optic ports which are connected to lasers. To protect your eyes against radiation harm, never stare into an open fiber-optic port.*

Step 1: Insert the SFP optical module into its corresponding slot.

Step 2: Locate the Rx and Tx ports of the MIM-1GEF/MIM-2GEF interface. Connect them to another device with two optical fibers: Rx to Tx and Tx to Rx.

Step 3: Power on the router and check the behavior of the LINK LED on the MIM-1GEF/MIM-2GEF panel. ON means an Rx link is present and OFF means the opposite. In the latter case, check the line status.

MIM-2SAE/MIM-4SAE/ MIM-8SAE Module

Introduction

MIM-2SAE/MIM-4SAE/MIM-8SAE stands for 2/4/8-port enhanced high-speed synchronous/asynchronous serial interface module. In terms of function, SAE modules are the same as SA modules except that SAE modules support more protocols, for example, RS449, X.21, and RS530.

Interface Attributes

The interface attributes of SAE modules are given in the following table:

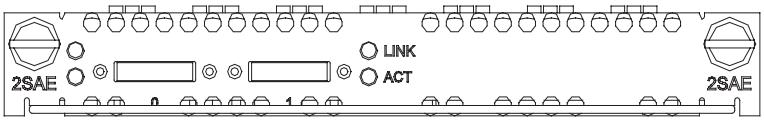
Table 43 Interface attributes of MIM-2SAE/MIM-4SAE/MIM-8SAE

	Description		
Attribute	**Synchronous**		**Asynchronous**
Connector	DB-28		
Number of connectors	2 (MIM-2SAE) 4 (MIM-4SAE) 8 (MIM-8SAE)		
Interface standard and operating mode	V.24	V.35, RS449, X.21, RS530	RS232
	DTE, DCE	DTE, DCE	
Minimum baud rate (bps)	1200	1200	300
Maximum baud rate (bps)	64 k	2.048 M	115.2
Cable	V.24 (RS232) DTE cable V.24 (RS232) DCE cable V.35 DTE cable V.35 DCE cable X.21 DTE cable X.21 DCE cable RS449 DTE cable RS449 DCE cable RS530 DTE cable RS530 DCE cable		
Supported service	1) DDN leased line 2) Terminal access service		1) Dialup through modems 2) Backup 3) Asynchronous leased line 4) Dumb terminal access

Interface LEDs

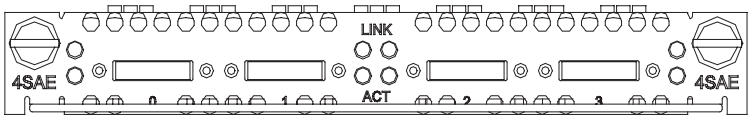
MIM-2SAE panel is shown in the following figure:

Figure 73 MIM-2SAE panel



MIM-4SAE panel is shown in the following figure:

Figure 74 MIM-4SAE panel



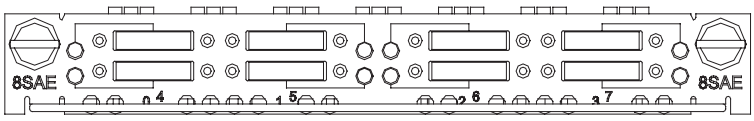
The following table describes the LEDs on the MIM-2SAE/MIM-4SAE panel:

Table 44 Description of the LEDs on the MIM-2SAE/MIM-4SAE panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

MIM-8SAE panel is shown in the following figure:

Figure 75 MIM-8SAE panel



On MIM-8SAE module, each link corresponds to a LED. ON means the link is connected. Blinking means data is being transmitted or received.

Interface Cable

SAE modules use synchronous/asynchronous serial interface cables with DB-28 connectors for connection.

Before connecting to a port on 2SAE, confirm the line properties. There are ten cable options depending on different line properties:

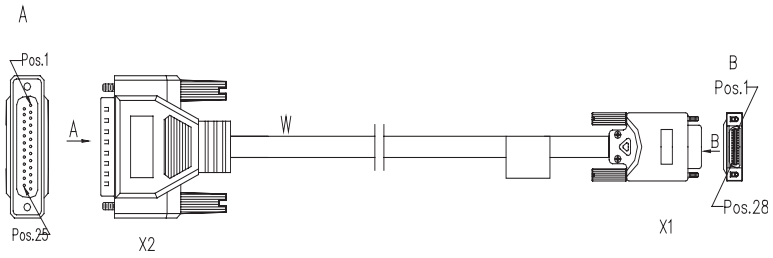
- V.24 (RS232) DTE cable: DB-25 (male) connector at the network end
- V.24 (RS232) DCE cable: DB-25 (female) connector at the network end
- V.35 DTE cable: 34PIN (male) connector at the network end
- V.35 DCE cable: 34PIN (female) connector at the network end
- X.21 DTE cable: DB-15 (male) connector at the network end
- X.21 DCE cable: DB-15 (female) connector at the network end

- RS449 DTE cable: DB-37 (male) connector at the network end
- RS449 DCE cable: DB-37 (female) connector at the network end
- RS530 DTE cable: DB-25 (male) connector at the network end
- RS530 DCE cable: DB-25 (female) connector at the network end

At one end of these cables is a DB-28 connector and at the other end is the connector that varies with the port at the network side.

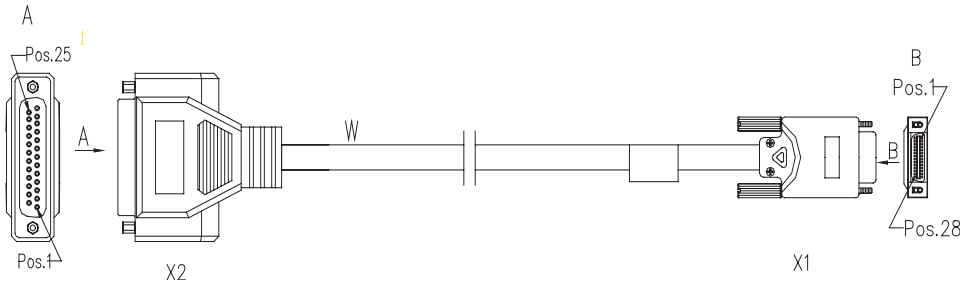
- V.24 DTE cable

Figure 76 V.24 DTE cable



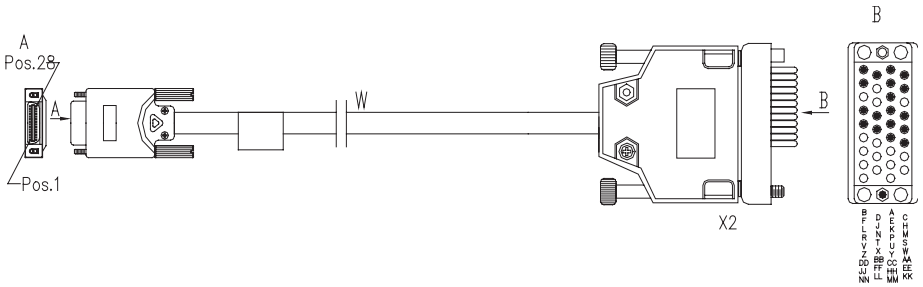
- V.24 DCE cable

Figure 77 V.24 DCE cable



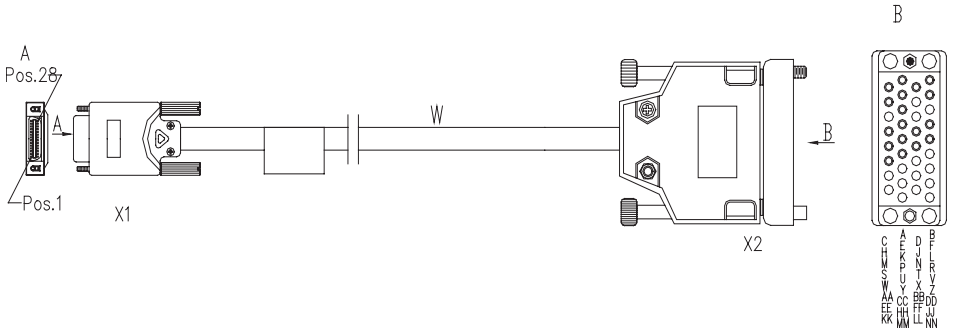
- V.35 DTE cable

Figure 78 V.35 DTE cable



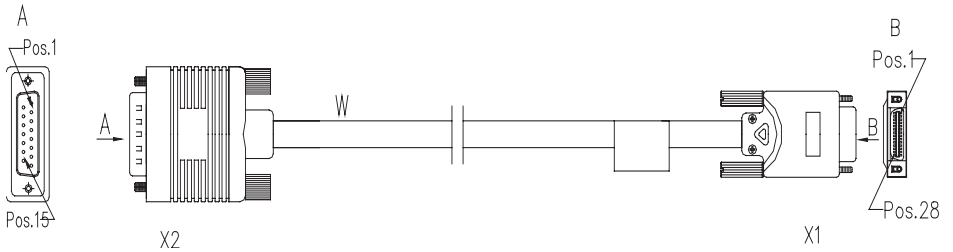
- V.35 DCE cable

Figure 79 V.35 DCE cable



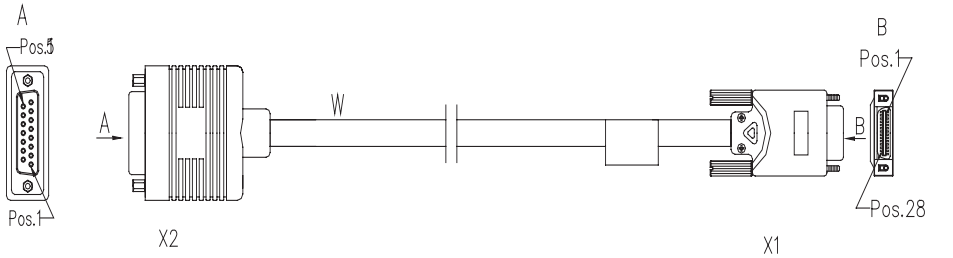
- X.21 DTE cable

Figure 80 X.21 DTE cable



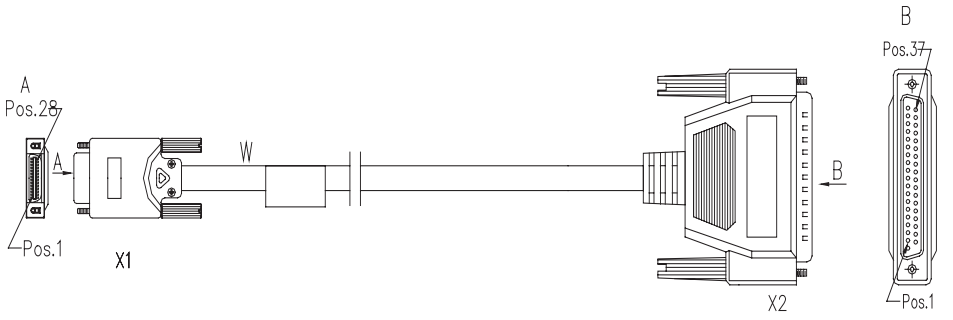
- X.21 DCE cable

Figure 81 X.21 DCE cable



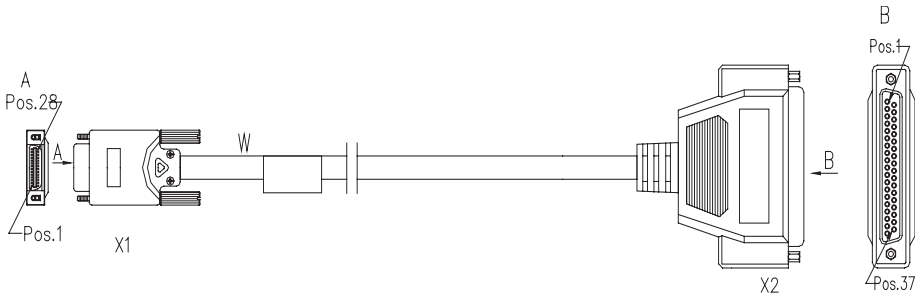
- RS449 DTE cable

Figure 82 RS449 DTE cable



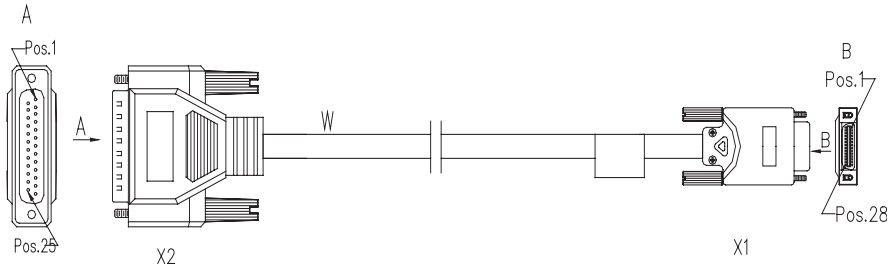
- RS449 DCE cable

Figure 83 RS449 DCE cable



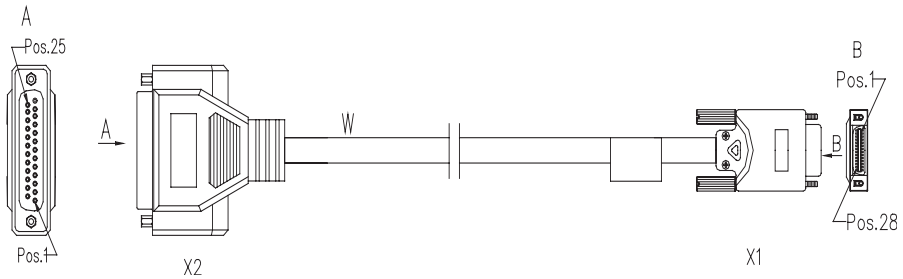
- RS530 DTE cable

Figure 84 RS530 DTE cable



- RS530 DCE cable

Figure 85 RS530 DCE cable



For the pinouts of synchronous/asynchronous serial cables (with DB-28 connectors), see *Low-End and Mid-Range Series Routers Cable Manual*.

These cables are optional. Please select one when purchasing an SAE module; by default, the cables are not provided.

Connecting the Interface Cable

WARNING: *Before plugging or unplugging interface cables connected to an SAE module, power off the router. Online insertion or removal tends to damage the port and even the device.*

CAUTION: *Before connecting an SAE module, confirm the model of the equipment to be connected (that is, the synchronous/asynchronous mode, DTE/DCE mode, and so on), signaling criterion required by the access equipment, baud rate, and timing clock.*

Step 1: Choose a synchronous/asynchronous serial interface cable depending on the type of the interface on the remote device.

Step 2: Plug the DB-28 connector of the cable to the appropriate DB28 port on the SAE module.

Step 3: Connect the other end of the SAE cable to:

- Port of CSU/DSU if the WAN is a DDN line;
- Serial port on an analog modem if the WAN is a dial-up line;

Step 4: Check the behavior of the LINK LED on the SAE panel. It is OFF when the line is faulty and signal is out of synchronization.

MIM-8ASE/MIM-16ASE Module

Introduction

Like AS modules, 8/16-port enhanced asynchronous serial interface module (MIM-8ASE/MIM-16ASE) transmits/receives and handles asynchronous serial interface data streams. But ASE modules use RJ-45 connectors and AUX cables.

Interface Attributes

The interface attributes of MIM-8ASE/MIM-16ASE are given in the following table:

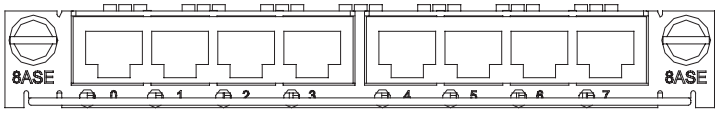
Table 45 Interface attributes of MIM-8ASE/MIM-16ASE

	Description	
Attribute	**MIM-8ASE module**	**MIM-16ASE module**
Connector	RJ-45	
Number of connectors	8 (MIM-8ASE) 16 (MIM-16ASE)	
Interface standard and operating mode	RS232	
Cable	AUX cable Ethernet straight-through cable MIM-8ASE/MIM-16ASE dumb terminal cable	
Minimum baud rate (bps)	300	
Maximum baud rate (bps)	115.2 k	
Service supported	1) Dialup through Modem 2) Backup 3) Terminal access service 4) Asynchronous leased line service	

Interface LEDs

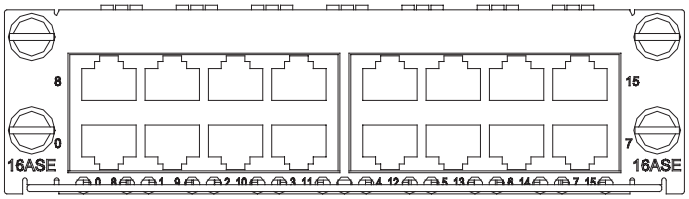
MIM-8ASE panel is shown in the following figure:

Figure 86 MIM-8ASE panel



MIM-16ASE panel is shown in the following figure:

Figure 87 MIM-16ASE panel



Each channel on MIM-8ASE/MIM-16ASE has only one LED. It is ON when the link is connected, and blinks when the link is active (that is, transmitting/receiving data).

Interface Cable

There are two types of interface cables for MIM-8ASE and MIM-16ASE: AUX cable and dumb terminal cable (RJ-45-RJ-45), which can be made on site using a network cable. See *Low-End and Mid-Range Series Routers Cable Manual* for their pinouts.

CAUTION: *AUX cable is optional. When ordering an MIM-8ASE or MIM-16ASE module, please order an AUX cable also. By default, it is not provided. As for dumb terminal cables, you can make them on site by reference to Low-End and Mid-Range Series Routers Cable Manual.*

Connecting the Interface Cable

WARNING: *Before plugging or unplugging interface cables connected to an MIM-8ASE or MIM-16ASE module, power off the Router. Online insertion or removal tends to damage the module and even the device.*

CAUTION: *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage interface modules and even the Router.*

Step 1: Check port type of the device to be connected and choose the correct cable;

Step 2: Connect one end of the cable to the Router and the other end to the peer device;

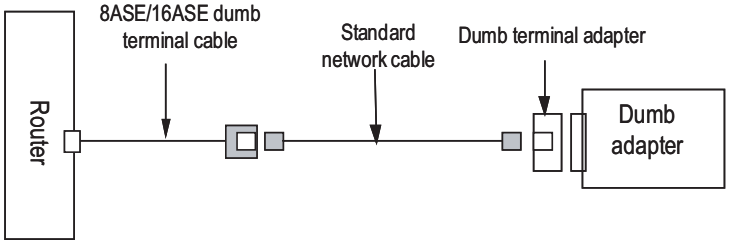
- AUX cable

Connect the DB-25/DB-9 connector to the network device, usually a modem;

- Dumb terminal cable

Connect the RJ-45 connector (female) to a standard network cable and then to a dumb terminal adapter;

Figure 88 Connecting MIM-8ASE/MIM-16ASE cable to a dumb terminal



Step 3: Check the behavior of the LINK LED on the MIM-8ASE/MIM-16ASE panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

MIM-1E1/MIM-2E1/MIM-4E1/MIM-1E1-F/MIM-2E1-F/MIM-4E1-F Modules

Introduction

MIM-1E1/MIM-2E1/MIM-4E1

MIM-1E1/MIM-2E1/MIM-4E1, the 1-/2-/4-port channelized E1/PRI interface module, transmits, receives, and processes E1 data traffic. In addition, you can use the card for other purposes, such as CE1 access and the ISDN PRI function.

MIM-1E1-F/MIM-2E1-F/MIM-4E1-F

The MIM-1E1-F/MIM-2E1-F/MIM-4E1-F module is different from the MIM-1E1/MIM-2E1/MIM-4E1 module in the sense that:

- The FE1 operating mode supported by the E1-F cards allows only one n × 64 kbps bundle to be formed on each interface, where n = 1 to 31. However, an E1 card allows arbitrary grouping of 31 channels and multiple bundles.
- The E1-F modules do not support PRI mode.

Interface Attributes

The interface attributes of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F are given in the following table:

Table 46 Interface attributes of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F

	Description		
Attribute	**MIM-1E1/1E1-F module**	**MIM-2E1/2E1-F module**	**MIM-4E1/4E1-F module**
Connector	DB-15	DB-15	DB-25
Number of connectors	1	2	1
Interface standard	G.703, G.704		

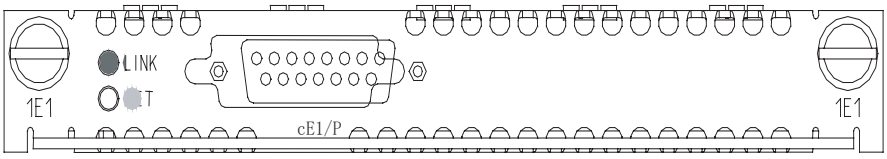
Table 46 Interface attributes of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F

Attribute	Description		
	MIM-1E1/1E1-F module	MIM-2E1/2E1-F module	MIM-4E1/4E1-F module
Interface rate	2.048 Mbps		
Cable type	E1 75-ohm non-balanced coaxial cable		
	E1 120-ohm balanced twisted pair cable		
	120-ohm 4E1 conversion cable (MIM-4E1/MIM-4E1-F modules)		
	75-ohm 4E1 conversion cable (MIM-4E1/MIM-4E1-F modules)		
	Coaxial connector, network interface connector and 75-ohm to 120-ohm adapter (with BNC connector)		
Operating mode	E1, CE1, ISDN PRI (only supported by MIM-1E1/MIM-2E1/MIM-4E1)		
	FE1 (only supported by MIM-1E1-F/MIM-2E1-F/MIM-4E1-F)		
Supported service	1) Backup		
	2) Terminal access service		
	3) ISDN PRI (only supported by MIM-1E1/MIM-2E1/MIM-4E1)		

Interface LEDs

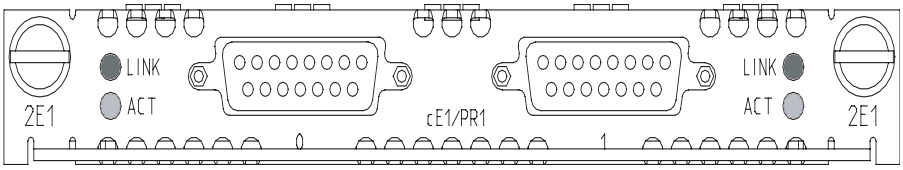
MIM-1E1 and MIM-1E1-F panels are similar. The following figure illustrates an MIM-1E1 panel.

Figure 89 MIM-1E1 panel



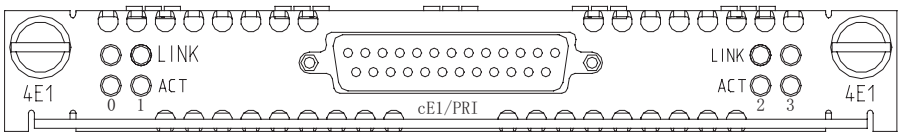
The panels of MIM-2E1 and MIM-2E1-F are similar. The following figure illustrates an MIM-2E1 panel.

Figure 90 MIM-2E1 panel



MIM-4E1 and MIM-4E1-F panels are similar. The following figure illustrates an MIM-4E1 module.

Figure 91 MIM-4E1 panel



The following table describes the LEDs on MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F panels:

Table 47 Description of the LEDs on MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F panels

LED	Description
LINK	ON means the carrier signal has been received. OFF means no carrier signal has been received.
ACTIVE	OFF means no data is being transmitted or received. ON means data is being transmitted or received.

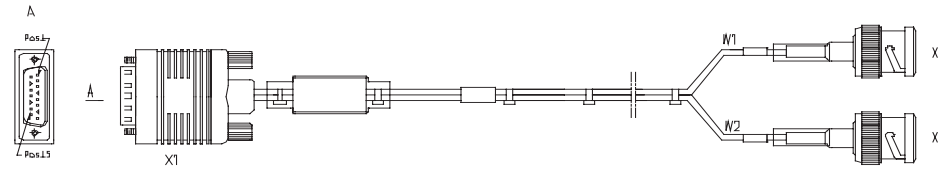
Interface Cable

Interface cable of MIM-1E1/MIM-2E1 and MIM-1E1-F/MIM-2E1-F modules

MIM-1E1/MIM-2E1 and MIM-1E1-F/MIM-2E1-F interface cables are G.703-compliant cables (referred to as E1 cables throughout the rest part of the manual). E1 cables are divided into two types: 75-ohm unbalanced coaxial cables and 120-ohm balanced twisted pair cables.

- 75-ohm unbalanced coaxial cable

Figure 92 E1 75-ohm unbalanced coaxial cable

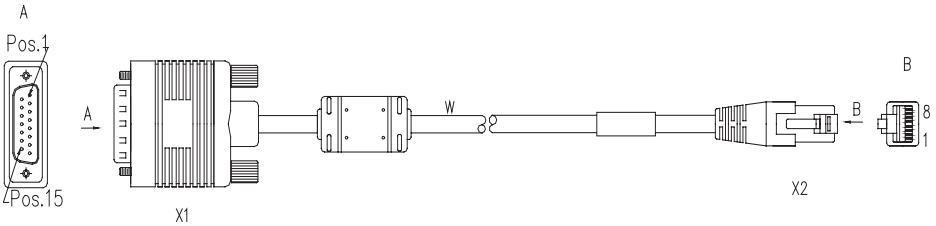


You can select a pair of coaxial connectors with a BNC receptacle at both ends that connect two 75-ohm unbalanced coaxial cables with BNC connectors. The coaxial connectors are used for the extension connection with E1 75-ohm unbalanced coaxial cable.

- 120-ohm balanced twisted pair cable

At the router side, the connector of the cable is DB-15 (male); at the network side, the connector is RJ-45, as illustrated in the following figure.

Figure 93 E1 120-ohm balanced twisted pair cable



You can select a network interface connectors with an RJ-45 receptacle at both ends that connect two 120-ohm balanced twisted pair cables with BNC connectors. The network interface connector is used in the extension connection with E1 120-ohm balanced twisted pair cables.

In addition, a 75-ohm to 120-ohm adapter is provided.

For the pinouts of E1 cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *E1 cable, coaxial connector, network interface connector and 75-ohm to 120-ohm adapter are all optional accessories. Please order them when purchasing MIM-1E1/MIM-2E1 or MIM-1E1-F/MIM-2E1-F modules; by default, they are not provided.*

Conversion cable for MIM-4E1/MIM-4E1-F module

MIM-4E1/MIM-4E1-F modules provide two types of "1-to-4" conversion cables: 120-ohm 4E1 conversion cable and 75-ohm 4E1 conversion cable. At one end of these two types of cables is a DB-25 connector used to connect a router, and at the other end are four DB-15 connectors used to connect E1 cables. You can distinguish these two types of cables by the main labels. There are the words "MIM-4E1-120ohm-CAB" printed on the main label for 120-ohm 4E1 conversion cables whereas the words "MIM-4E1-75ohm-CAB" are printed on the main label for 75-ohm 4E1 conversion cables.

The two types of cables have a similar appearance, as illustrated in the following figures. However, a 75-ohm 4E1 conversion cable uses 8-core coaxial cables but a 120-ohm 4E1 conversion cable uses four twisted pair cables.

Figure 94 120-ohm 4E1 conversion cable

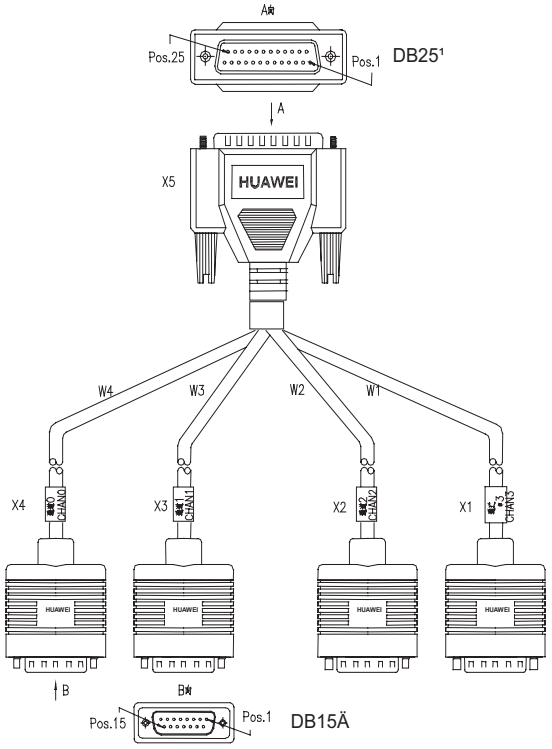
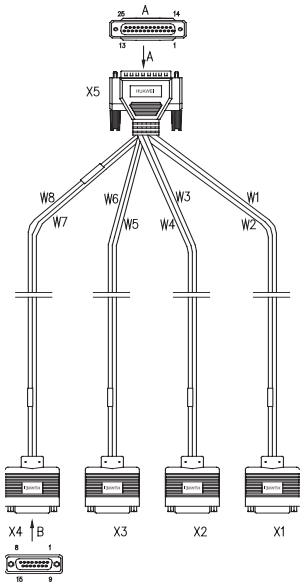


Figure 95 75-ohm 4E1 conversion cable



CAUTION: *Both 75-ohm 4E1 and 120-ohm 4E1 conversion cables are required for MIM-4E1/4E1-F modules. While E1 cable is optional, please order E1 cables when purchasing an MIM-4E1 or MIM-4E1-F module. By default, they are not provided.*

In addition, a 75-ohm to 120-ohm adapter is provided. For the pinouts of cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

Internal DIP Switches

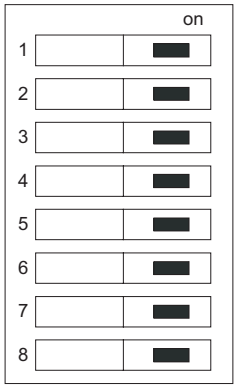
MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules provide internal DIP switches, and the setting of DIP switches decides the interface impedance and grounding mode.

Table 48 Correlation between DIP switches of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules and E1 interface

Module		**MIM-1E1/1E1-F**		**MIM-2E1/2E1-F**		**MIM-4E1/4E1-F**	
DIP switch	S1	S1	S2	S1	S3	S4	S5
E1 interface	Interface 0	Interface 0	Interface 1	Interface 0	Interface 1	Interface 2	Interface 3

By default, all the DIP switches for MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules are set to ON, as illustrated in the following figure:

Figure 96 Default setting of DIP switches for MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules



Description of DIP switch settings is given in the following table for MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules:

Table 49 Description of DIP switch settings of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules

DIP	Description	Configuration of 75-ohm impedance	Configuration of 120-ohm impedance
1BIT	75-ohm/120-ohm selection switch	ON	OFF
2BIT		ON	OFF
3BIT		ON	OFF
4BIT		ON	OFF
5BIT		ON	OFF
6BIT	RxRing grounding mode selection switch	OFF: RxRing is grounded via capacitance. ON: RxRing is grounded directly.	-
7BIT	RxShield grounding mode selection switch	-	ON: RxShield is grounded. OFF: RxShield is not grounded.
8BIT	SxShield grounding mode selection switch	-	OFF: RxShield is grounded via capacitance ON: RxShield is grounded directly.

CAUTION:

- *It is recommended to select the DIP switch of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules in this way: when connecting 75-ohm cable, flip BIT1-8 to ON, and when connecting 120-ohm cable, flip BIT1-8 to OFF. Positions of DIP switches can only be changed by the trained personnel.*

- *By default, all of the DIP switches of MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules are factory-configured to ON, that is, the impedance of E1 interface is 75-ohm.*

Connecting the Interface Cable

CAUTION:

- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage interface modules and even the Router;*
- *Some protection measures are taken for MIM-1E1/MIM-2E1/MIM-4E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules. Still, you are recommended to install a special lightning arrester at the input end of the cable leading to the outdoors in order to protect the line against lightning strikes more efficiently.*

Connecting interface cable of MIM-1E1/MIM-2E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules

Step 1: Check the type of E1 cable, and set the DIP switches of MIM-1E1/MIM-2E1 or MIM-1E1-F/MIM-2E1-F module correctly;

Step 2: Plug the DB-15 connector of the E1 cable into the E1/FE1 port on the module;

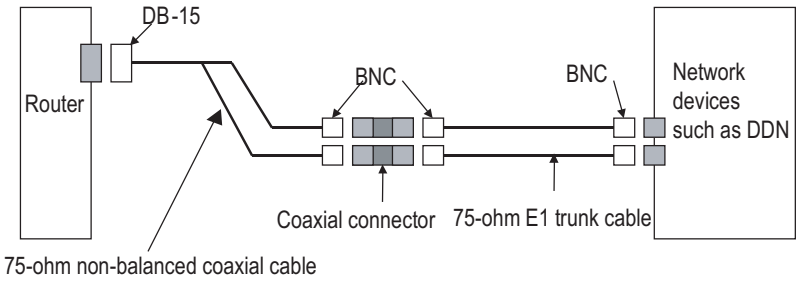
Step 3: Connect the other end of the E1 cable to the network device;

1 When using 75-ohm unbalanced coaxial cable,

- Connect its BNC connector to the device to be connected directly, if cable extension is not needed;
- Connect its BNC connector to a coaxial connector and the other end of the coaxial connector to the device to be connected through a 75-ohm E1 trunk cable, if cable extension is needed;

CAUTION: *Connect the local Tx wire in the E1 cable to the remote Rx wire and the local Rx wire to the remote Tx wire.*

Figure 97 Extending an E1 75-ohm unbalanced coaxial cable

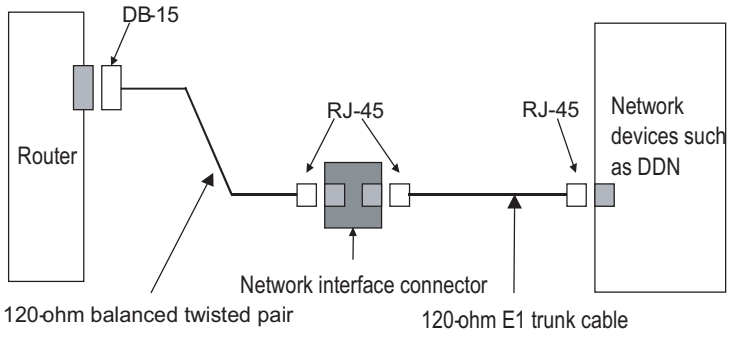


- If the port on the network device to be connected has a 120-ohm port, use a 75-ohm to 120-ohm adapter, or use a 120-ohm cable instead.

2 When using a 120-ohm balanced twisted pair cable,

- Connect its RJ-45 connector to the RJ-45 port on the device to be connected directly, if cable extension is not needed.
- Connect its RJ-45 connector to a network interface connector and then the other end of the network interface connector to the network device to be connected through a 120-ohm E1 trunk cable, if cable extension is needed.

Figure 98 Extending an E1 120-ohm balanced twisted pair cable



Step 4: Check the behavior of the LINK LED on the module panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

Connecting interface cable of MIM-4E1/MIM-4E1-F

Step 1: Select the appropriate 4E1 cable and E1 cable according to type of the port on the remote device, and set DIP switches of MIM-4E1 or MIM-4E1-F module correctly;

- If the resistance of the port on the device to be connected is 75-ohm, select a 75-ohm E1 non-balanced coaxial cable and a 75-ohm 4E1 conversion cable, and set all the DIP switches on the MIM-4E1/MIM-4E1-F module to "ON" (that is, the port resistance is 75-ohm).
- If the resistance of the port on the device to be connected is 120-ohm, select a 120-ohm E1 balanced twisted pair cable and a 120-ohm 4E1 conversion cable, and set all the DIP switches on the MIM-4E1/MIM-4E1-F module to "OFF" (that is, the port resistance is 120-ohm).

Step 2: Plug the DB-25 connector of the 4E1 conversion cable into a DB-25 port on MIM-4E1 or MIM-4E1-F module, and tighten the screws;

Step 3: Connect the DB-15 connector of the 4E1 conversion cable to the E1 cable, making sure of wire sequence of the connector;

Step 4: Connect the E1 cable to the device to be connected. For the procedures, see "Connecting interface cable of MIM-1E1/MIM-2E1 and MIM-1E1-F/MIM-2E1-F/MIM-4E1-F modules" on page 87.

Step 5: Check the behavior of the LINK LED on the module panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

MIM-8E1/MIM-8E1-F Module

Introduction

MIM-8E1 module

MIM-8E1, the 8-port channelized E1/PRI interface module, transmits, receives, and processes eight channels of E1 data traffic. In addition, you can use the module for other purposes, such as CE1 access and the ISDN PRI function.

MIM-8E1-F module

MIM-8E1-F, the 8-port fractional E1 interface module is different from the MIM-8E1 module in the sense that:

- The FE1 operating mode supported by the MIM-8E1-F module allows only one n × 64 kbps bundle to be formed on each interface, where n = 1 to 31. However, an MIM-8E1 module allows arbitrary grouping of 31 channels and therefore multiple bundles.
- The MIM-8E1-F module does not support PRI mode.

Given a MIM-8E1 module, the system automatically creates a serial interface for each timeslot bundle formed on a controller E1 interface.

Interface Attributes

The interface attributes of the MIM-8E1 and the MIM-8E1-F are given in the following table:

Table 50 Interface attributes of the MIM-8E1 and the MIM-8E1-F

	Description	
Attribute	**MIM-8E1/MIM-8E1-F module (75-ohm)**	**MIM-8E1/MIM-8E1-F module (120-ohm)**
Connector	DB-68	
Number of connectors	1	
Interface standard	G.703	
Interface rate	2.048 Mbps	
Cable type	75-ohm 8E1 conversion cable	120-ohm 8E1 conversion cable
Cable characteristic impedance	75-ohm	120-ohm
Operating mode	E1, CE1, ISDN PRI (only supported by MIM-8E1) FE1 (only supported by MIM-8E1-F)	
Supported service	1) Backup 2) Terminal access service 3) ISDN PRI (only supported by MIM-8E1)	

Interface LEDs

MIM-8E1 and MIM-8E1-F panels are similar. The following figures illustrate MIM-8E1 panels.

Figure 99 MIM-8E1 (120-ohm) panel

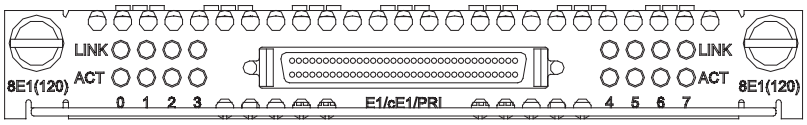
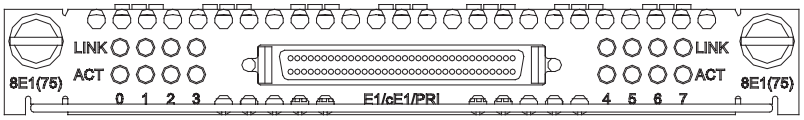


Figure 100 MIM-8E1 (75-ohm) panel



The following table describes the LEDs on the MIM-8E1/MIM-8E1-F panel:

Table 51 Description of the LEDs on the MIM-8E1/MIM-8E1-F panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received. ON means data is being transmitted or received.

Interface Cable

The MIM-8E1/MIM-8E1-F module provides eight E1 ports and adopts a 120-ohm or a 75-ohm 8E1 conversion cable. The two types of cables look similar. Both of them have a DB-68 connector at one end for connecting the router. At the other end, however, the 75-ohm 8E1 conversion cable provides 16 coaxial cable connectors; and the 120-ohm 8E1 conversion cable provides eight twisted pair cable connectors, as shown in the following figures:

Figure 101 75-ohm 8E1 conversion cable

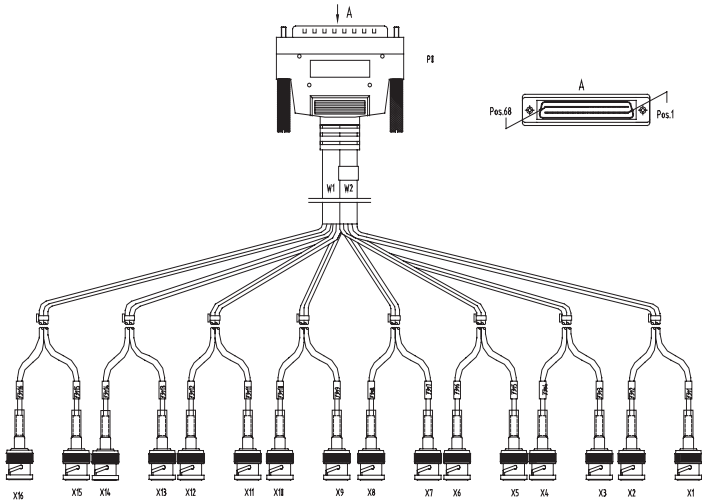
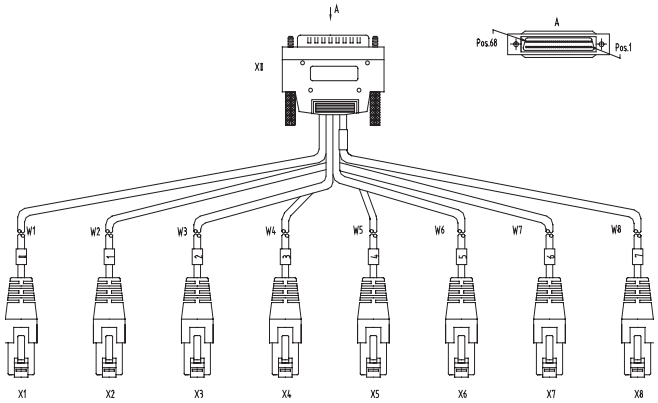


Figure 102 120-ohm 8E1 conversion cable



Connecting the Interface Cable

CAUTION: *Before you connect a port, read its label carefully; a wrong connection can impair the interface module and even damage the device.*

You are recommended to install a special lightning arrester at the input end of the interface cable for better lightning protection.

Step 1: Choose an 8E1 conversion cable appropriate to the interface type of the peer device.

- If the interface impedance of the peer device is 75-ohm, use a 75-ohm 8E1 conversion cable.
- If the interface impedance of the peer device is 120-ohm, use a 120-ohm 8E1 conversion cable.

Step 2: Insert the DB-68 connector of the cable to the DB-68 port on the MIM-8E1/MIM-8E1-F module, and fasten the cable fastening screws.

Step 3: Identify the sequence number of the other end of the MIM-8E1/MIM-8E1-F conversion cable and connect it with a peer device.

Step 4: Power on the router. Check the behavior of the LINK LED on the module panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

MIM-1T1/MIM-2T1/MIM-4T1/MIM-1T1-F/MIM-2T1-F/MIM-4T1-F Modules

Introduction

MIM-1T1/MIM-2T1/MIM-4T1 module

1/2/4-port channelized T1/PRI interface module (MIM-1T1/MIM-2T1/MIM-4T1) serves to transmit/receive and handle T1 data streams, provide CT1 access, and fulfill the function of ISDN PRI. Thereby, one card can be used for multiple purposes.

MIM-1T1-F/MIM-2T1-F/MIM-4T1-F

1/2/4-port fractional T1 interface module (MIM-1/2/4T1-F) and MIM-1/2/4T1 module are different in the sense that:

- FT1 operating mode supported by T1-F modules allows only one bundle. In other words, the time slots can only be bundled into one nx64 kbps or 56 kbps channel, where n=1-24. However, a CT1 module allows of arbitrary grouping of the 24 channels;
- T1-F does not support PRI mode.

Given a MIM-1T1 module, the system automatically creates a serial interface for each timeslot bundle formed on a controller T1 interface.

Interface Attributes

The interface attributes of MIM-1T1/MIM-2T1/MIM-4T1 and MIM-1T1-F/MIM-2T1-F/MIM-4T1-F modules are given in the following table:

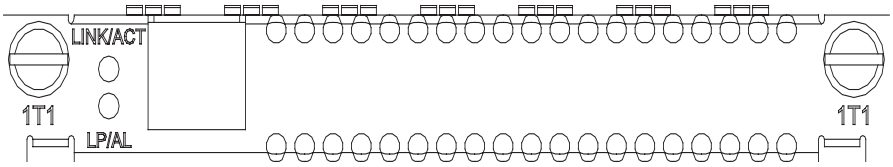
Table 52 Interface attributes of MIM-1T1/MIM-2T1/MIM-4T1 and MIM-1T1-F/MIM-2T1-F/MIM-4T1-F modules

Attribute	Description
Connector	RJ-45
Number of connectors	1 (MIM-1T1/MIM-1T1-F module)
	2 (MIM-2T1/MIM-2T1-F module)
	4 (MIM-4T1/MIM-4T1-F module)
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm shielding network cable)
Operating mode	CT1, ISDN PRI (MIM-1T1/MIM-2T1/MIM-4T1 module)
	FT1 (MIM-1T1-F/MIM-2T1-F/MIM-4T1-F module)
Supported service	1) Backup
	2) Terminal access service
	3) ISDN PRI (MIM-1T1/MIM-2T1/MIM-4T1 module)

Interface LEDs

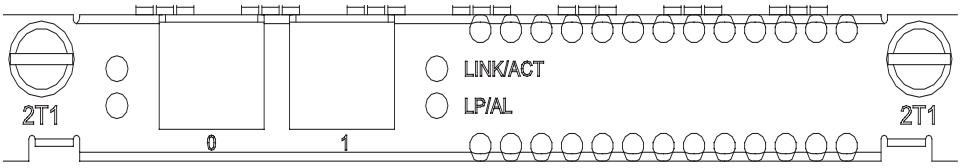
MIM-1T1 panel is similar to that of MIM-1T1-F. The following figure shows a MIM-1T1 panel.

Figure 103 MIM-1T1 panel



MIM-2T1 panel is similar to that of MIM-2T1-F, and they differ only in module name. The following figure shows a MIM-2T1 panel.

Figure 104 MIM-2T1 panel



MIM-4T1 panel is similar to that of MIM-4T1-F, and they differ in silk-screen. The following figure shows a MIM-4T1 panel.

Figure 105 MIM-4T1 panel

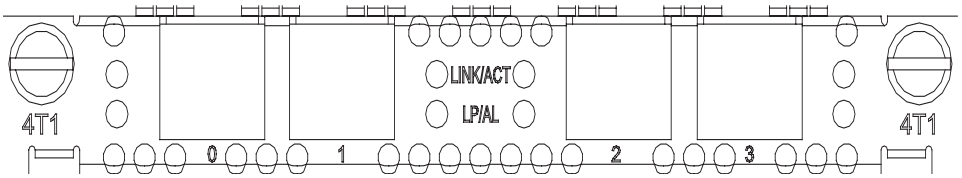


Table 53 Description of the LEDs on MIM-1T1/MIM-2T1/MIM-4T1 and MIM-1T1-F/MIM-2T1-F/MIM-4T1-F panels

LED	Description
LINK/ACT	ON means the carrier signal has been received. OFF means no carrier signal has been received. Blinking means data is being transmitted or/and received.
LP/AL	ON means the interface is in a loopback. Blinking means an AIS, LFA, or RAI alarm signal is present. OFF means no loopback or alarm is present.

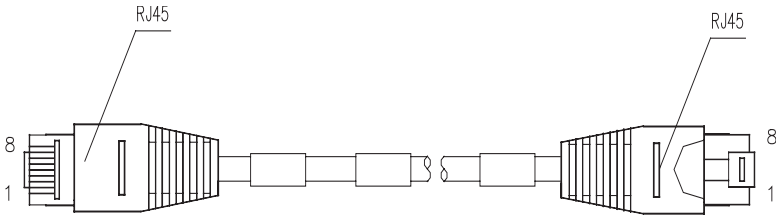
Note:

AIS = Alarm indication signal; LFA = loss of frame alignment; RAI = Remote alarm indication

Interface Cable

Interface cables (T1 cables) for MIM-1T1/MIM-2T1/MIM-4T1 and MIM-1T1-F/MIM-2T1-F/MIM-4T1-F modules are 100-ohm straight-through shielding network cables, as shown in the following figure:

Figure 106 T1 cable



In addition, you may use a network interface connector to extend a T1 cable. Both ends of the connector are RJ-45 jacks that can connect two network cables.

CAUTION: *Both T1 cable and network interface connector are optional accessories. Please order them together with the MIM-1T1/MIM-1T1/MIM-4T1 or MIM-1T1-F/MIM-2T1-F/MIM-4T1-F module. By default, they are not provided.*

For the cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting the Interface Cable

CAUTION:

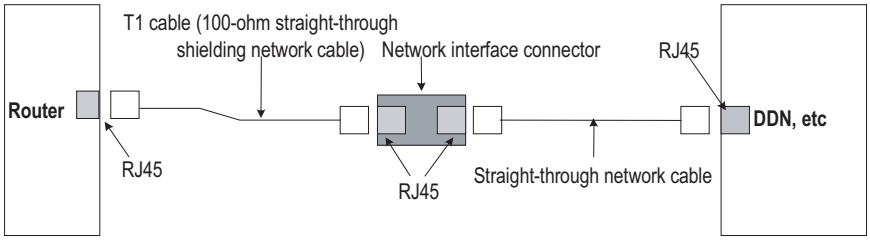
- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage interface modules and even the Router;*
- *Some protection measures are taken for MIM-1T1/MIM-2T1/MIM-4T1 module. Still, you are recommended to install a special lightning arrester at the input end of the cable leading to the outdoors in order to protect the line against lightning strikes more efficiently.*

Step 1: Insert one end of a T1 cable into the RJ-45 connector on the T1 or T1-F module;

Step 2: Connect the other end of the cable to the device to be connected:

- directly if the cable is long enough; or
- after extending the cable if it is not long enough, as shown in the following figure:

Figure 107 Extending a T1 cable



Step 3: Check the behavior of the LINK LED on the MIM-T1 or MIM-T1-F panel. It is OFF when the line is faulty and signal is out of synchronization. In this case, check the link.

MIM-8T1/MIM-8T1-F Module

Introduction

MIM-8T1 module

MIM-8T1, the 8-port channelized T1/PRI interface module, transmits, receives, and processes eight channels of T1 data traffic. In addition, you can use the module for other purposes, such as CT1 access and the ISDN PRI function.

MIM-8T1-F module

MIM-8T1-F, the 8-port fractional T1 interface module is different from the 8T1 module in the sense that:

- The FT1 operating mode supported by the MIM-8T1-F module allows only one n × 64 kbps or n × 56 kbps bundle to be formed on each interface, where n = 1 to 24. However, the MIM-8T1 module allows arbitrary grouping of 24 channels and therefore multiple bundles.
- The MIM-8T1-F module does not support PRI mode.

Given a MIM-8T1 module, the system automatically creates a serial interface for each timeslot bundle formed on a controller T1 interface.

Interface Attributes

The interface attributes of the MIM-8T1 and the MIM-8T1-F are given in the following table:

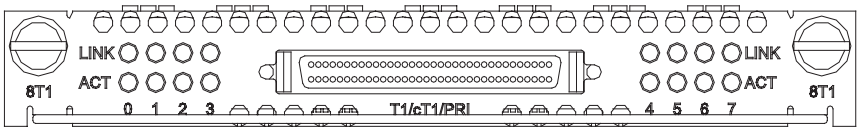
Table 54 Interface attributes of the MIM-8T1 and the MIM-8T1-F

Attribute	Description
Connector	RJ-45
Number of connectors	1
Interface standard	G.703/T1 102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	8T1 conversion cable
Operating mode	CT1, ISDN PRI (only supported by the MIM-8T1)
	FT1 (only supported by the MIM-8T1-F)
Supported service	1) Backup
	2) Terminal access service
	3) ISDN PRI (only supported by the MIM-8T1)

Interface LEDs

MIM-8T1 and MIM-8T1-F panels are similar. The following figure illustrates an MIM-8T1 panel.

Figure 108 MIM-8T1 panel



The following table describes the LEDs on the MIM-8T1/8T1-F panel:

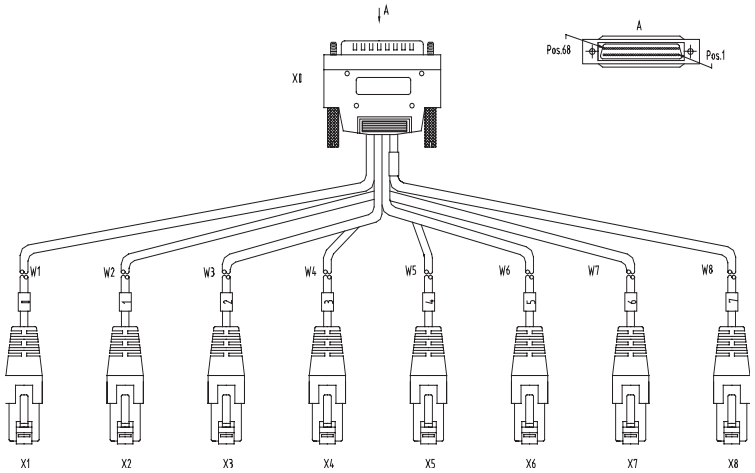
Table 55 Description of the LEDs on the MIM-8T1/MIM-8T1-F panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received. ON means data is being transmitted or received.

Interface Cable

The following figure illustrates the 8T1 conversion cable for the MIM-8T1/MIM-8T1-F module.

Figure 109 8T1 conversion cable



At one end of the cable is a DB-68 connector for connecting the router and at the other end are eight RJ-45 connectors for connecting other devices.

Connecting the Interface Cable

CAUTION: *Before you connect a port, read its label carefully; a wrong connection can impair the interface module and even damage the device.*

You are recommended to install a special lightning arrester at the input end of the interface cable for better lightning protection.

Step 1: Insert the DB-68 connector of the 8T1 conversion cable to the DB-68 port on the MIM-8T1/MIM-8T1-F module.

Step 2: Connect one RJ-45 connector at the other end of the cable to the device to be connected.

Step 3: Power on the router. Check the behavior of the LINK LED on the module panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

MIM-1CE3 Module

Introduction 1-port channelized E3 interface module (MIM-1CE3) serves to:

- Transmit/Receive and handle one channel of E3 fast traffic, as well as provide the accessing of E3 traffic when working in E3 mode; and
- Provide the low-speed accessing service at the speed of n × 64 kbps, where n is smaller than or equal to 128, when working in CE3 mode.

- *E3 represents the tertiary group rate of E system in the TDM system, that is, 34.368Mbps. An E3 channel can be channelized into 16 E1 lines through the demultiplexing processes of E23 and E12, each E1 line supporting both the operating modes of E1 and CE1. E23 is used to indicate either E2-to-E3 multiplex or E3-to-E2 demultiplex, and E12 to indicate E1-to-E2 multiplex or E2-to-E1 demultiplex. "E23" and "E12" discussed here represent the demultiplex process.*
- *The two E3 channels of 2CE3 can work in E3 and CE3 mode respectively.*

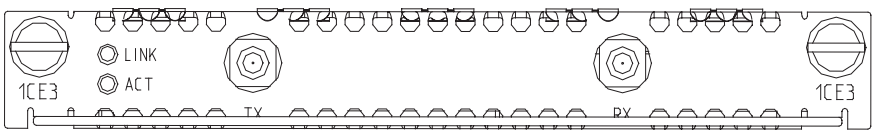
Interface Attributes The interface attributes of MIM-1CE3 are given in the following table:

Table 56 Interface attributes of 1CE3

Attribute	Description
Connector	SMB
Number of connectors	2
Interface standard	G.703, G.704, G.751
Interface rate	34.368 Mbps
Interface cable type	E3 cable (75ohm coaxial cable)
Operating mode	E3
	CE3
Supported service	E3 leased line

Interface LEDs MIM-1CE3 panel is shown in the following figure:

Figure 110 MIM-1CE3 panel



The following table describes the LEDs on the MIM-1CE3 panel:

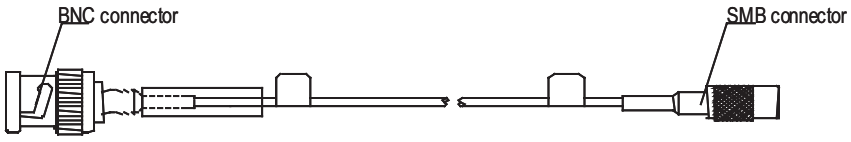
Table 57 Description of the LEDs on the MIM-1CE3 panel

LED	Description
LINK	OFF means the link is not set up. ON means the link has been set up.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The external interface provided by a MIM-1CE3 module is two SMB sockets respectively for Tx (Transmitter end) and Rx (Receiver end). The interface adopts 75ohm unbalanced transmission mode and uses a pair of 75ohm unbalanced coaxial cables to connect the peer device.

Figure 111 E3/T3 cable



- *MIM-1CE3 and 1CT3 adopt the same cable, which is called E3/T3 cable in this manual.*
- *The standard shipment package of MIM-1CE3 does not include the interface cable.*

Connecting the Interface Cable

CAUTION: *Some measures have been taken to protect the MIM-1CE3 module. To achieve better lightning protection effects, however, you are recommended to add a special lightning arrester at the input end of the E3 or T3 cable when it is led outdoors.*

Step 1: Connect the SMB connector of an E3 or T3 cable to the Tx port of MIM-1CE3 and another end to the Rx port of the device to be connected;

Step 2: Connect the SMB connector of another E3 or T3 cable to the Rx port of MIM-1CE3 and another end to the Tx port of the peer device;

Step 3: Check the behavior of the LINK LED on the MIM-1CE3 panel. It is OFF when the line is faulty and signal is out of synchronization. In this case, check the link.

MIM-1CT3 Module

Introduction

1-port channelized T3 interface module (MIM-1CT3) serves to:

- Transmit/Receive and handle one channel of T3 fast traffic, as well as provide the accessing of T3 traffic when working in T3 mode; and
- Provide the low-speed accessing service at the speed of n × 64 kbps or 56 kbps, where n is smaller than or equal to 128, when working in CT3 mode.

T3 represents the tertiary group rate of T system in the TDM system, that is, 44.736 Mbps. A T3 channel can be channelized into 28 T1 lines through the demultiplexing processes of T23 and T12, each T1 line also supporting the operating modes of CT1. T23 is used to indicate either T2-to-T3 multiplex or T3-to-T2 demultiplex, and T12 to indicate T1-to-T2 multiplex or T2-to-T1 demultiplex. "T23" and "T12" discussed here represent the demultiplex process.

Interface Attributes

The interface attributes of MIM-1CT3 are given in the following table:

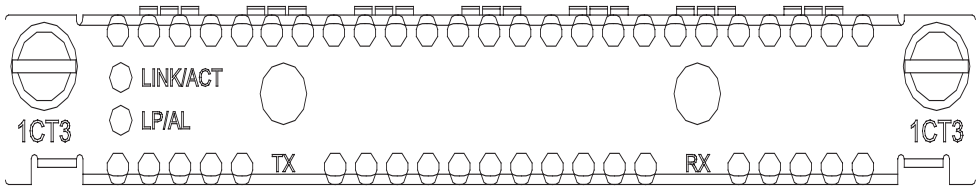
Table 58 Interface attributes of MIM-1CT3

Attribute	Description
Connector	SMB
Number of connectors	2
Interface standard	G.703
	G.704
	G.752
	AT&T TR 54014
	AT&T TR 62415
	ANSI T1.107
Interface rate	44.736 Mbps
Interface cable type	T3 cable (75-ohm coaxial cable)
Operating mode	T3
	CT3
Supported service	T3 leased line

Interface LEDs

MIM-1CT3 panel is shown in the following figure:

Figure 112 MIM-1CT3 panel



The following table describes the LEDs on the MIM-1CT3 panel:

Table 59 Description of the LEDs on the MIM-1CT3 panel

LED	Description
LINK/ACT	ON means the carrier signal has been received. OFF means no carrier signal has been received. Blinking means data is being transmitted or/and received.
LP/AL	ON means the interface is in a loopback. Blinking means an AIS, LFA, or RAI alarm signal is present. OFF means no loopback or alarm is present.

Note:

AIS = Alarm indication signal; LFA = loss of frame alignment; RAI = Remote alarm indication

Interface Cable

MIM-1CT3 and MIM-1CE3 use the same type of interface cables and make connection in the same way. For details, see "MIM-1CE3 Module" on page 97.

E3/T3 cables are not provided together with MIM-1CT3 and shall be prepared by the user.

MIM-4BSE Module

Introduction

MIM-4BSE, the four-port ISDN BRI interface module, transmits, receives, and processes four channels of ISDN BRI S/T data traffic on ISDN BRI S/T interfaces.

The MIM-4BSE differs from the 4BS only in the way they set matched resistance for an ISDN BRI S/T interface: the 4BS uses jumpers while the MIM-4BSE uses DIP switches.

The MIM-4BSE can work in dial mode or leased line mode.

Interface Attributes

The following table describes the interface attributes of the MIM-4BSE.

Table 60 Interface attributes of the MIM-4BSE

Attribute	Description
Connector	RJ-45
Number of connectors	4
Cable	ISDN S/T cable
Protocol & standard	ITU-T I.430, Q.921, Q.931
Operating mode	ISDN dial-up ISDN leased line

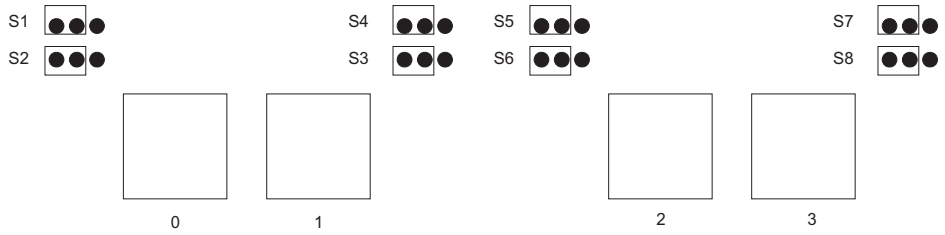
Table 60 Interface attributes of the MIM-4BSE

Attribute	Description
Supported service	ISDN
	ISDN supplementary services
	Multi-user number
	Sub-addressing
	Backup

Jumper Settings

The MIM-4BSE uses jumpers to set matched resistance for ISDN BRI S/T interfaces. The use of 100-ohm resistance on an ISDN BRI S/T interface depends on jumper settings. The following figure shows the jumper settings, where all the ISDN BRI S/T interfaces are using 100-ohm resistance.

Figure 113 Jumper settings of the MIM-4BSE (example)



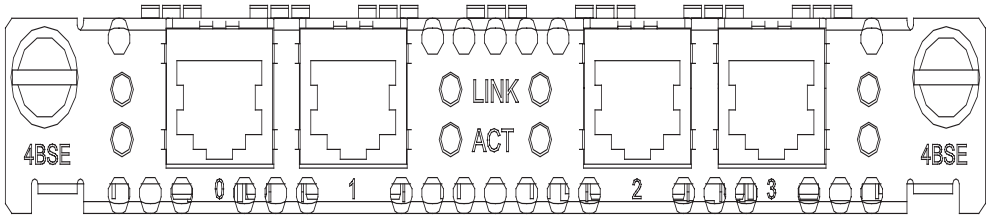
The following table describes how to set jumpers.

Table 61 Set the jumpers on the MIM-4BSE

Jumper settings & description			Default
Interface 0	S2	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	The jumpers are placed over jump pins 2 and 3, meaning 100-ohm matched resistances are not used.
	S1	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	
Interface 1	S4	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	
	S3	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	
Interface 2	S6	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	
	S5	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	
Interface 3	S8	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	
	S7	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 113.	

Interface LEDs The following figure illustrates the MIM-4BSE panel.

Figure 114 MIM-4BSE panel



The following table describes the LEDs on the module panel.

Table 62 LEDs on the MIM-4BSE panel

LED	Description
LINK	OFF means no link is present.
	ON means a link is present.
ACT	OFF means no data is being received or transmitted.
	Blinking means data is being received and/or transmitted.

Interface Cable

The MIM-4BSE uses straight-through ISDN S/T cables, with pins 3 and 6 for data transmission, and pins 4 and 5 for data receiving. At both ends of ISDN S/T cable are RJ-45 connectors.

Figure 115 Straight-through ISDN S/T cable

The standard equipping package for the MIM-4BSE includes the appropriate interface cables.

Connecting the Interface Cable

CAUTION: *If outdoor cabling is involved, consider to install a special lightning arrester at the input end of the interface cable for better lightning protection.*

Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.

Step 1: Identify the to-be-connected port on the MIM-4BSE.

Step 2: Identify the type of the ISDN line provided by your telecommunications service provider.

Step 3: Connect the cable.

- For an ISDN U interface line, adapt the interface with an NT1 by inserting one end of the S/T interface cable into the S/T port on the NT1 and the other end to the BRI port on the MIM-4BSE.
- For an ISDN S/T interface line, directly connect the cable to the BRI port on the MIM-4BSE.

MIM-1G.SHDSL

Introduction

1-port Single-Pair High-Speed Digital Subscriber Line module (MIM-1G.SHDSL) adopts the Trellis Coded Pulse Amplitude Modulation (TCPAM) approach and can provide the symmetric speed as high as 2.3 Mbps. Its transmission speed can automatically adapt to cable length and conditions. Compared with ADSL, G.SHDSL allows longer transmission distance and as such, can serve a wider range of applications. It can substitute for E1/T1 lines to provide high-speed data service access. However, as TCPAM uses the band starting from 0 Hz for data transmission, G.SHDSL cannot share the same line with POTS or ISDN just like what ADSL has done.

The MIM-1G.SHDSL module supports:

- Manual G.SHDSL line activation/deactivation and easy-to-use fault isolation tools;
- G.992.1 interface standard and auto-sensing.

Interface Attributes

The interface attributes of MIM-1G.SHDSL are given in the following table:

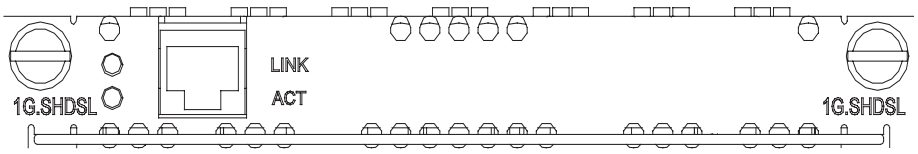
Table 63 Interface attributes of MIM-1G.SHDSL module

Attribute	MIM-1G.SHDSL module
Connector	RJ11
Number of connectors	1
Interface standard	G.991.2
Interface rate	In single-pair mode, supports the sending/receiving independent symmetric speed in the range 192 kbps to 2304 kbps, with the step length being 8 kbps.
Cable	Telephone cable
Supported service	G.SHDSL access over telephone lines

Interface LEDs

MIM-1G.SHDSL panel is shown in the following figure:

Figure 116 MIM-1G.SHDSL panel



The following table describes the LEDs on the MIM-1G.SHDSL panel:

Table 64 Description of the LEDs on the MIM-1G.SHDSL panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The MIM-1G.SHDSL module uses regular telephone cables for connection.

Telephone cables have been included in the standard shipment package of MIM-1G.SHDSL.

Connecting the Interface Cable

You only need a telephone cable to connect one port on a G.SHDSL module to the PSTN network.

MIM-1AMM/MIM-1ASM/MIM-1ASL

Introduction

By far, the following ATM modules are available for the routers:

- 1-port ATM (Asynchronous Transfer Mode) 155 Mbps multimode fiber interface module (MIM-1AMM)
- 1-port ATM 155 Mbps single-mode fiber interface module (MIM-1ASM)
- 1-port ATM 155 Mbps single-mode long-haul fiber interface module (MIM-1ASL)

These ATM modules function in the system to provide ATM interfaces for routers, supporting:

- Two frame formats: SDH STM-1 and SONET OC-3;
- Scrambling in data transmission;
- Both line clock (when working as DTE interface), and internal clock (when working as DCE interface);
- Local cell loopback, local payload loopback, and remote loopback.

Interface Attributes

Table 65 Interface attributes of MIM-1AMM/MIM-1ASM/MIM-1ASL

Attribute	MIM-1AMM module	MIM-1ASM module	MIM-1ASL module
Optical fiber connector	SC		
Number of ports	1		
Interface standard	SONET OC-3/SDH STM-1		
Interface rate	155 Mbps		

Table 65 Interface attributes of MIM-1AMM/MIM-1ASM/MIM-1ASL

Attribute	MIM-1AMM module	MIM-1ASM module	MIM-1ASL module
Cable type and the maximum transmission distance	Multimode optical fiber of 2 km (1.2 mi.) transmission distance	Single-mode optical fiber of 15 km (9.32 mi.) transmission distance	Single-mode optical fiber of 30 km (18.6 mi.) transmission distance
Transmitter	LED	Laser	Laser
Transmission optical power	Min: -21 dBm Max: -14 dBm	Min: -15 dBm Max: -8 dBm	Min: -5 dBm Max: 0 dBm
Receiver sensitivity	Min: -28 dBm Max: -8 dBm	Min: -30 dBm Max: -14 dBm	Min: -34 dBm Max: -10 dBm
Central wavelength	1310 nm		
Service	ATM Traffic CBR (Constant Bit Rate), rt_VBR (Variable Bit Rate-Real Time), nrt_VBR (Variable Bit Rate-Non Real Time), UBR (Unspecified Bit Rate)		

Interface LEDs

MIM-1AMM/MIM-1ASM/MIM-1ASL module panels are shown in the following figures:

Figure 117 MIM-1AMM panel

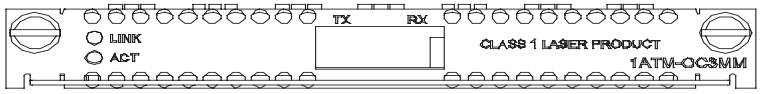


Figure 118 MIM-1ASM panel

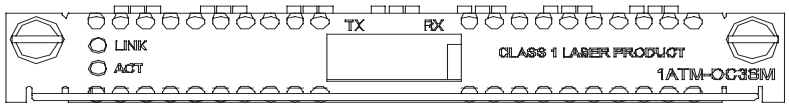
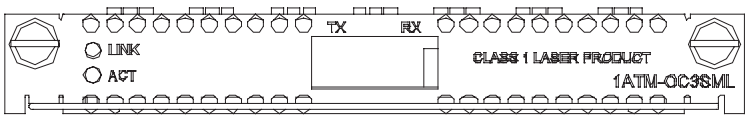


Figure 119 MIM-1ASL panel



The following table describes the LEDs on the panels:

Table 66 Description of the LEDs on the MIM-1AMM/MIM-1ASM/MIM-1ASL panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Optical Fiber

MIM-1AMM uses multi-mode optical cable and MIM-1ASM/MIM-1ASL uses single-mode optical cable. As all these three modules adopt SC optical fiber connector, the connector of the connection cable should also be SC connector. The external optical cable suite provides you with optical cables of different lengths.

WARNING: *Laser danger! Do not directly stare at the optical fiber connector connected with the laser, in case of the injury that may cause to your eyes.*

CAUTION:

- *MIM-1ASL module adopts long-haul fiber interface, requiring a transmission at least longer than 25 km (15.5 in.). If the transmission distance is lower than 25km, the interface will be unable to receive signals.*
- *MIM-1AMM module should be connected with multi-mode optical fibers whereas MIM-1ASM/MIM-1ASL modules should be connected with single-mode optical fibers.*

These cables are optional. Please order them when purchasing MIM-1AMM/MIM-1ASM/MIM-1ASL modules; by default, they are not provided.

MIM-1AE3 Module

Introduction

1-port 34.368 Mbps ATM-E3 interface module (MIM-1AE3) supports:

- Two ATM cell mapping modes: ATM Direct Mapping (ADM) and Physical Layer Convergence Protocol (PLCP);
- Scrambling in data transmission;
- Both line clock (when working as DTE interface) and internal clock (when working as DCE interface);
- Four types of test measures, that is, local cell loopback, local payload loopback, remote payload loopback, and remote line loopback.

You are allowed to equip an H3C Series Router with MIM-AE3 modules to its full capacity. Yet, you are recommended to install only one MIM-AE3 module on it, whatever its model is, to ensure the performance of some key services.

Interface Attributes

The interface attributes of MIM-1AE3 are given in the following table:

Table 67 Interface attributes of MIM-1AE3

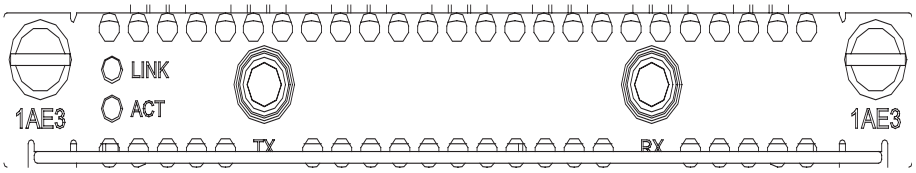
Attribute	1AE3 module
Connector	SMB
Connector number	2
Interface standard	G.703, G.751, G.832, G.823
Interface rate	34.368 Mbps
Cable	E3/T3 cable (75-ohm coaxial cables)
Supported service	ATM Traffic CBR, rt_VBR, nrt_VBR, UBR

In the supported services described in the above table, CBR represents Constant Bit Rate, rt_VBR represents Variable Bit Rate-Real Time, nrt_VBR represents Variable Bit Rate-Non Real Time, and UBR represents Unspecified Bit Rate.

Interface LEDs

MIM-1AE3 panel is shown in the following figure:

Figure 120 MIM-1AE3 panel



The following table describes the LEDs on the MIM-1AE3 panel:

Table 68 Description of the LEDs on the MIM-1AE3 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

External ports provided by MIM-1AE3 are two SMB sockets respectively functioning as Tx end and Rx end for transmitting data and receiving data. The ports work in 75-ohm unbalanced transmission mode and are connected to the peer device using a pair of 75-ohm unbalanced coaxial cables. Several cable length options are available.

Figure 121 E3/T3 cable

MIM-1AE3 and MIM-1AT3 modules use the same type of cables for connection, which are called E3/T3 cables in this manual.

Connecting the Interface Cable

CAUTION: *Some measures have been taken to protect MIM-1AE3 module. To achieve better lightning protection effects, however, you are recommended to add a special lightning arrester at the input end of the E3/T3 cable when leading it to the outdoors.*

Step 1: Connect the SMB connector of an E3/T3 cable to the Tx port on MIM-1AE3 and another end to the Rx port on the device to be connected;

Step 2: Connect the SMB connector of another E3/T3 cable to the Rx port of MIM-1AE3 module and another end to the Tx port on the device to be connected;

Step 3: Check the behavior of the LINK LED on the MIM-1AE3 panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

MIM-1AT3 Module

Introduction

1-port 44.736 Mbps ATM-T3 interface module (MIM-1AT3) supports:

- Two ATM cell mapping modes: ADM and PLCP;
- Scrambling in data transmission;
- Both line clock (when working as DTE interface) and internal clock (when working as DCE interface);
- Four types of test measures, i.e., local cell loopback, local payload loopback, remote payload loopback, and remote line loopback.

You are allowed to equip an H3C Series Router with MIM-AT3 modules to its full capacity. Yet, you are recommended to install only one MIM-AT3 module on it, whatever its model is, to ensure the performance of some key services.

Interface Attributes

The interface attributes of MIM-1AT3 are given in the following table:

Table 69 Interface attributes of MIM-1AT3 module

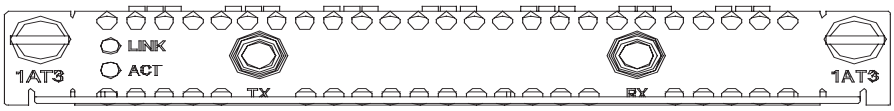
Attribute	1AT3 Module
Connector	SMB
Connector number	2
Interface standard	G.703, G.704, G.823
Interface rate	44.736 Mbps
Cable	E3/T3 cable (75-ohm coaxial cables)
Supported service	ATM Traffic CBR, rt_VBR, nrt_VBR, UBR

In the supported services described in the above table, CBR represents Constant Bit Rate, rt_VBR represents Variable Bit Rate-Real Time, nrt_VBR represents Variable Bit Rate-Non Real Time, and UBR represents Unspecified Bit Rate.

Interface LEDs

MIM-1AT3 panel is shown in the following figure:

Figure 122 MIM-1AT3 panel



The following table describes the LEDs on the MIM-1AT3 panel:

Table 70 Description of the LEDs on the MIM-1AT3 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

External ports provided by MIM-1AT3 module are two SMB sockets respectively functioning as Tx end and Rx end for transmitting data and receiving data. The ports work in 75-ohm unbalanced transmission mode and are connected to the peer device using a pair of 75-ohm unbalanced coaxial cables as shown in Figure 121. Several cable length options are available.

MIM-1AE3 and MIM-1AT3 modules use the same type of cables for connection, which are called E3/T3 cables in this manual.

Connecting the Interface Cable

CAUTION: *Some measures have been taken to protect MIM-1AT3 module. To achieve better lightning protection effects, however, you are recommended to add a special lightning arrester at the input end of the E3/T3 cable when leading it to the outdoors.*

Step 1: Connect the SMB connector of an E3/T3 cable to the Tx port of MIM-1AT3 module and another end to the Rx port on the device to be connected;

Step 2: Connect the SMB connector of another E3/T3 cable to the Rx port of MIM-1AT3 module and another end to the Tx port on the device to be connected;

Step 3: Check the behavior of the LINK LED on the MIM-1AT3 panel. It is OFF when fault has occurred on the link and signal is out of synchronization. In this case, please check the link.

MIM-1POS Module

Introduction

MIM-1POS represents the 1-port SDH/SONET interface module. It supports interface rates up to 155.52 Mbps (STM-1/OC-3).

The MIM-1POS can use the protocols such as PPP, Frame Relay and HDLC at the data link layer and IP at the network layer. It allows direct transmission of packets over SONET/SDH. It supports:

- Four SFP types: multi-mode short-haul (1310 nm), single mode medium-haul (1310 nm), single mode long-haul (1310 nm), and single-mode ultra-long haul (1550 nm).
- 155.52 Mbps fractional interface

Interface Attributes

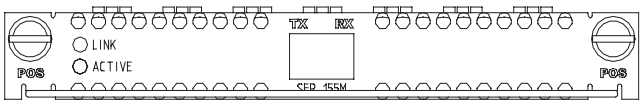
Table 71 Interface attributes of the MIM-1POS

Attribute		MIM-1POS			
Connector		SFP/LC			
Interface standard		SONET OC-3/SDH STM-1			
Number of interfaces		1			
Interface rate		155.52 Mbps			
Transmitting optical power	Type	Multi-mode short-haul	Single mode medium-haul	Single mode long-haul	Single mode ultra-long haul
	Min.	-19.0 dBm	-15.0 dBm	-5.0 dBm	-5.0 dBm
	Max.	-14.0 dBm	-8.0 dBm	0. dBm	0. dBm
Receiver sensitivity		-30.0 dBm	-28.0 dBm	-34.0 dBm	-34.0 dBm
Overload optical power		-14.0 dBm	-7.0 dBm	-9.0 dBm	-10.0 dBm
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Fiber type		62.5/125 μm multi-mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode
Max. transmission segment		2 km (1.2 mi.)	15 km (9.32 mi.)	40 km (24.86 mi)	80 km (49.71 mi)

Interface LEDs

The following figure illustrates the MIM-1POS panel:

Figure 123 MIM-1POS panel



The following table describes the LEDs on the MIM-1POS panel:

Table 72 Description of the LEDs on the MIM-1POS panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

Same as the MIM-1CPOS, the MIM-1POS uses LC fiber-optic connectors and must be connected using fiber-optic with an LC connector.

Connecting the Interface Cable

Step 1: Insert the SFP module into its corresponding slot.

Step 2: Locate the Rx and Tx fiber-optic interfaces on the module. Use two fibers to connect the MIM-1POS to another device, with Rx to Tx and Tx to Rx.

Step 3: Check the LINK LED on the MIM-1POS panel: ON means the Rx link is present and OFF means the opposite. Check the line in the second case.

WARNING: *Because invisible laser radiation may be emitted from the aperture of an optical port when no fiber is connected or the dust cap is removed, do not stare into the open aperture.*

Replace the dust cap when no fiber is connected to the optical port.

MIM-2FXS/MIM-2FXO/ MIM-2E&M and MIM-4FXS/MIM-4FXO/ MIM-4E&M

Introduction

2/4-port voice subscriber circuit interface module (MIM-2FXS/MIM-4FXS) serves to access and handle 2/4 channels of ordinary analog phone, fax, or AT0 loop trunk of telephone exchange.

2/4-port voice AT0 analog trunk interface module (MIM-2FXO/MIM-4FXO) serves to access and handle 2/4 channels of common user lines of telephone exchange.

2/4-port voice E&M analog trunk interface module (MIM-2E&M/MIM-4E&M) serves to access and handle 2/4 channels of E&M analog trunks.

These modules make it possible to transfer voice signals over data communication networks.

CAUTION: *When connecting a voice MIM, make sure that H3C Series Routers can be connected to an IP network or other LAN.*

Interface Attributes

The interface attributes of MIM-2FXS/MIM-2FXO/MIM-2E&M and MIM-4FXS/MIM-4FXO/MIM-4E&M modules are given in the following table:

Table 73 Interface attributes of MIM-2FXS/MIM-2FXO/MIM-2E&M and MIM-4FXS/MIM-4FXO/MIM-4E&M

Attribute	Description
Connector	RJ-45
Number of connectors	2 (MIM-2FXS/MIM-2FXO/MIM-2E&M module)
	4 (MIM-4FXS/MIM-4FXO/MIM-4E&M module)
Cable	Telephone cable with ferrite core
	E&M trunk (for E&M module, which should be made by users depending on the actual needs at the site.)

Table 73 Interface attributes of MIM-2FXS/MIM-2FXO/MIM-2E&M and MIM-4FXS/MIM-4FXO/MIM-4E&M

Attribute	Description
Interface standard	ITU Q.512-compliant subscriber circuit interface (MIM-2FXS/MIM-4FXS)
	ITU Q.552-compliant loop trunk interface (MIM-2FXO/MIM-4FXO)
	G.712-compliant E&M trunk interface (MIM-2E&M/MIM-4E&M), E&M interface (supporting Bell type I, II, III, V, and support 2-wire and 4-wire).
	ITU K.20-compliant overcurrent and overvoltage protection
Dial-up mode	DTMF (Dual-Tone Multi-Frequency) but not pulse dial-up
Bandwidth	300 Hz to 3400 Hz

Interface LEDs

Voice MIM panels are shown in the following figures:

Figure 124 MIM-2FXS panel

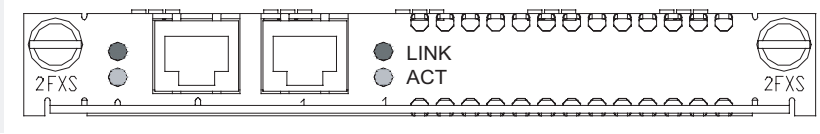


Figure 125 MIM-2FXO panel

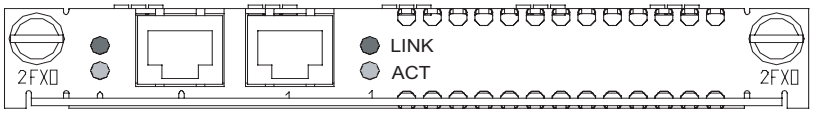


Figure 126 MIM-2E&M panel

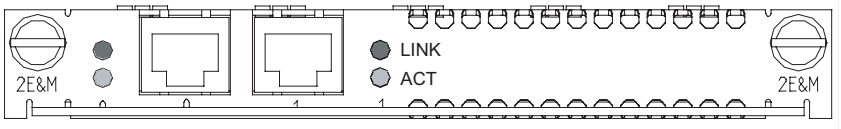


Figure 127 MIM-4FXS panel

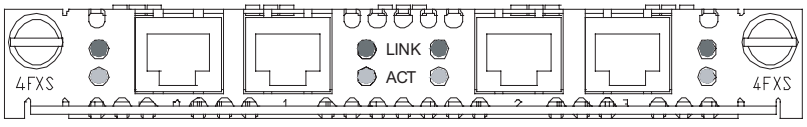


Figure 128 MIM-4FXO panel

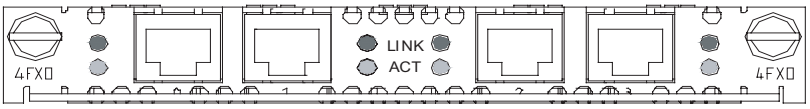


Figure 129 MIM-4E&M panel

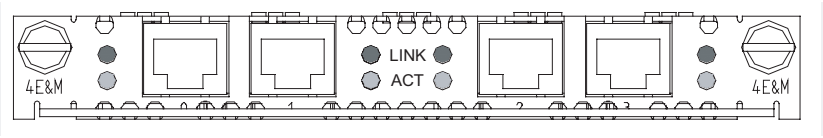


Table 74 Description of the LEDs on voice MIM panels

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means the channel is idle. ON means there is call activity.

Interface Cable

- *RJ-45 receptacles are used as external interfaces for FXS/FXO/E&M modules.*
- *Telephone cables have been included in the standard shipment package of MIM-2FXS/MIM-2FXO and MIM-4FXS/MIM-4FXO modules.*

Interface cable of FXS/FXO modules

Connection cables for MIM-2FXS/MIM-2FXO and MIM-4FXS/MIM-4FXO are telephone cables with ferrite core. For cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual*.

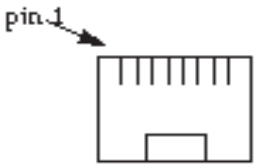
Interface cable of E&M modules

E&M modules of H3C Series Routers support Bell I, II, III, V switches, and 2-wire & 4-wire voice signals.

It is recommended to use Bell V 4-wire voice signal to communicate with the Router in practice.

The sequence of E&M RJ-45 pins is shown in the following figure, numbered 1 to 8 from left to right:

Figure 130 Sequence of RJ-45 pins



When connection is made in Bell V 4-wire mode, the pinouts of RJ-45 receptacles at router side and at the switch side are shown in the following figure:

Figure 131 E&M interface cable (Bell V 4-wire)

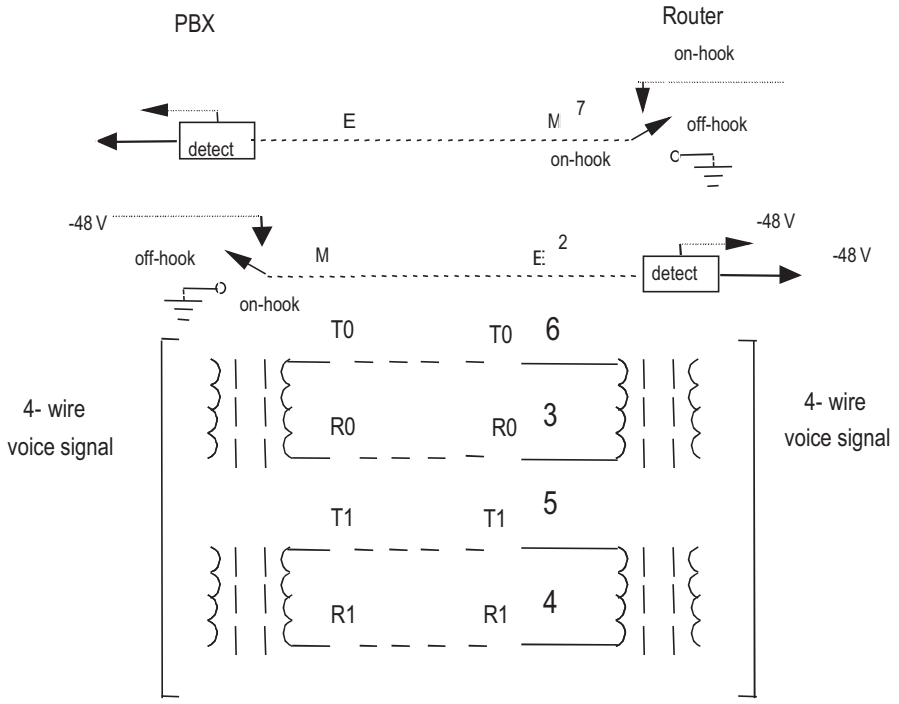


Table 75 Pinouts of E&M interface cable (Bell V 4-wire)

Router side		
RJ-45 Pin	**RJ-45 interface signal**	**Signal at switch side (Bell V 4-wire)**
1	SB (negative power supply)	-
2	E	M
3	RING0	RING0
4	RING1	RING1
5	TIP1	TIP1
6	TIP0	TIP0
7	M	E
8	SG (negative power supply ground)	-

Because it is hard to determine the type of the switch to be connected and its connectors, interface cables of MIM-2E&M/MIM-4E&M modules have to be prepared according to the on-spot conditions or by the user. To ensure the EMC of the Router, install a ferrite core near the connector of the prepared E&M module interface cable by the router side.

Connecting the Interface Cable

CAUTION:

- *Some measures are taken to protect MIM-2FXS/MIM-2FXO/MIM-2E&M and MIM-4FXS/MIM-4FXO/MIM-4E&M. Still, you are recommended to install a special lightning arrester at the input end of each connection cable to obtain better lightning protection effect when the cable is led outdoors;*

- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage interface modules and even the Router.*
- *As provisioned by Bell V, cables for FXS/FXO/E&M modules do not provide PGND wire. For this reason, a loop should be formed via the earth ground between the Router and the connected switch. In practice, the PGND wire of the switch can be connected to the chassis of the Router;*
- *To ensure the EMC of the whole Router, you should connect the end of the cable with ferrite core to the Router.*

Step 1: Plug one end of the cable into the RJ-45 port on 2FXS/2FXO/2E&M;

Step 2: Connect the other end of the cable to:

- Telephone set, fax or AT0 loop trunk of telephone exchange, if you have installed an FXS module;
- Subscriber line of telephone exchange, if you have installed an FXO module;
- E&M trunk of telephone exchange, if you have installed an E&M module;

MIM-HNDE Module

Introduction

High Network Data Encryption (MIM-HNDE for short) supports IPSec protocol, multiple hardware encryption/decryption and hash algorithm to speed up the encryption of the IP packets, featuring high-performance and high-reliability.

Insert MIM-HNDE module in the MIM slot of a low-end and mid-range modular router. The main board forwards the IP packets and implements the VPN with encryption feature which is complemented by encryption card.

Interface Attributes

Table 76 MIM-HNDE module features

Feature	Description
Protocol supported	IPSec
Hardware algorithm	1) key algorithm (DES, 3DES, AES)
	2) Authentication algorithm (HMAC-MD5-96, HMAC-SHA-1-96)

Interface LEDs

The front panel of MIM-HNDE module is shown in the following figure:

Figure 132 MIM-HNDE panel

Table 77 Description of the LEDs on the MIM-HNDE panel

LED	Indication
STATUS	ON (green): The MIM-HNDE module is powered on properly.
	OFF: There is no power supply, damaged power supply, or sever hardware failure.
ACTIVE	OFF after flashing yellow for two seconds: Initialized the MIM-HNDE module.
	Blinking continuously: The MIM-HNDE module operates normally and there is data transmission with the host.
	OFF: MIM-HNDE module runs normally and no data transmission exists with the host.

Troubleshooting

1 Symptom 1: The STATUS LED stays off after turning on the router.

Troubleshooting: The STATUS LED should stay solid on after powered on. The OFF status indicates that the MIM-HNDE module or some hardware is not powered on properly. Check the connection of the power supply.

If the device is powered on, the failure may due to the damaged power supply of the module, or abnormal operation of CPLD (Complex Programmable Logic Device). In these circumstances, contact our agents for support.

2 Symptom 2: The ACTIVE LED stays off when powering on the router.

Troubleshooting: When powering up the device, the ACTIVE LED should flashing for two seconds before turning off, which indicates the encryption processor of the MIM-HNDE module has been configured and is ready for work. If the ACTIVE LED stays on when powering up the device, this means the initialization of the processor fails and the system bus does not work normally. Check the connection between the MIM-HNDE module and the host. If the connection is good, the abnormal status may due to the host or the MIM-HNDE module, contact our agents for support.

3 Symptom 3: The ACTIVE LED stays on or off when the MIM-HNDE module is running.

Troubleshooting: The ACTIVE LED should be blinking when the MIM-HNDE module runs the encryption service. The solid on or off indicates the system bus works abnormally. Check the connection between the MIM-HNDE module and host. If the connection is good, the abnormal status may due to the host or the MIM-HNDE module, contact our agents for support.

MIM-2VE1 Module

Introduction

2-port E1 voice interface module (MIM-2VE1) can handle dense voice signals in VoIP system. It provides two CE1/PRI/R2 ports, allowing the access of 60 channels of voice signals.

- *VCPM is provided to users together with MIM-2VE1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of MIM-2VE1.*

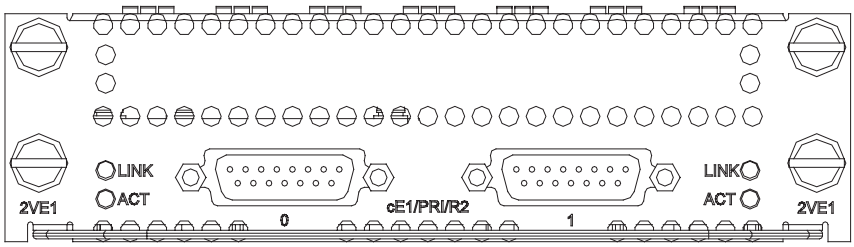
Interface Attributes The interface attributes of MIM-2VE1 are given in the following table.

Table 78 Interface attributes of MIM-2VE1

Attribute	Description
Connector	DB-15
Number of connectors	2
Operating mode	CE1
	ISDN PRI
	R2
Interface rate	2.048 Mbps
Cable	E1 120-ohm balanced twisted pair cable
	75ohm-to-120ohm adapter
Supported service	1) R2 signaling
	2) DSS1 signaling
	3) IP Fax
	4) General VoIP features in Comware

Interface LEDs MIM-2VE1 panel is shown in the following figure:

Figure 133 MIM-2VE1 panel



The following table describes the LEDs on the MIM-2VE1 panel:

Table 79 Description of the LEDs on the MIM-2VE1 panel

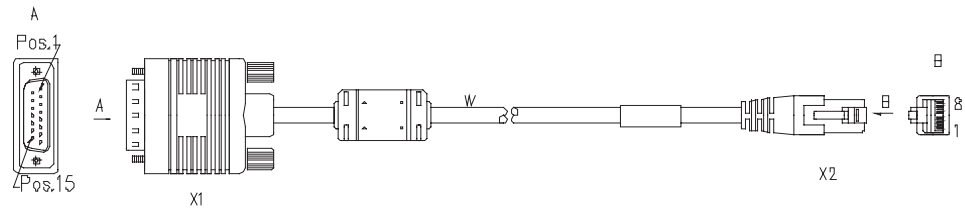
LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received. Blinking means there is data being transmitted or received.

The MIM-2VE1 module is 1U in height, occupying two slots.

Interface Cable

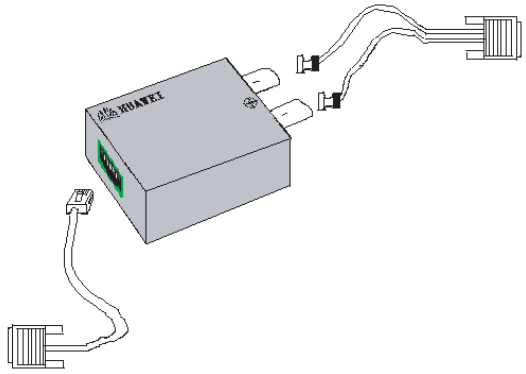
MIM-2VE1 interface cables are G.703-compliant 120-ohm balanced twisted pair cables. At one end of the cable is a DB-15 male connector for the connection to the Router, and at the other end is an RJ-45 connector for the connection to the network.

Figure 134 E1 120-ohm balanced twisted pair cable



If the cable with the resistance of 75-ohm is needed, a 75-ohm-to-120-ohm cable adapter (one end is BNC connector and the other end is RJ-45 connector) which is illustrated in the following figure can be installed.

Figure 135 75-ohm-to-120-ohm adapter (with BNC connector)



CAUTION:

- *For the convenience of extending the connection of E1 120-ohm balanced twisted pair cable, you can use network interface connector.*
- *E1 120-ohm balanced twisted pair cable, network interface connector, 75-ohm-to-120-ohm adapter are optional accessories. Please select one when purchasing a MIM-2VE1 module; by default, they are not provided.*

For cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual.*

Connecting the Interface Cable

CAUTION:

- *Some measures are taken to protect MIM-2VE1 module. Still, you are recommended to install a special lightning arrester at the input end of its connection cable to obtain better lightning protection when the cable is led outdoors;*

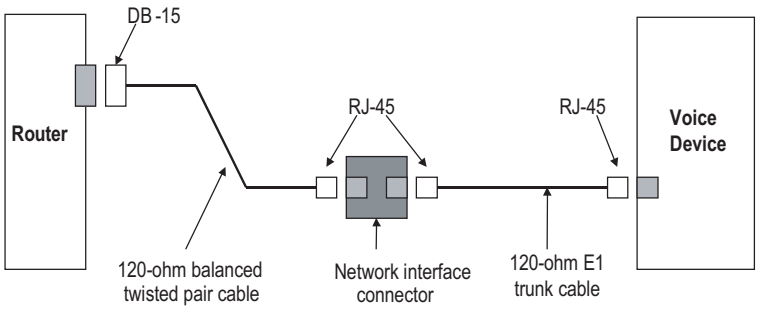
- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage the MIM and even the Router.*

Step 1: Plug the DB-15 connector of the cable into the DB-15 port on the MIM-2VE1 module and fasten the screws;

Step 2: Connect the RJ-45 connector of the cable to:

- The peer device directly, if the resistance of the port to be connected is 120-ohm, and there is no need to extend the cable;
- A network interface connector and then the peer device using another E1 120-ohm balanced twisted pair cable, if the resistance of the port to be connected is 120-ohm, and there is a need to extend the cable, as illustrated in the following figure.

Figure 136 Extending E1 120-ohm balanced twisted pair cable



- The peer device using a 75ohm-to-120ohm adapter, if the resistance of the peer device is 75-ohm;

Step 3: Check the behavior of the LINK LED on the MIM-2VE1 panel. It is OFF when fault has occurred on the link. In this case, please check the link.

MIM-2VT1 Module

Introduction

2-port T1 voice interface module (MIM-2VT1) can handle dense voice signals in VoIP system. It provides two CT1/PRI/ ports, allowing the access of 48 channels of voice signals.

- *VCPM is provided to users together with MIM-2VT1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of MIM-2VT1.*

Interface Attributes

The interface attributes of MIM-2VT1 are given in the following table.

Table 80 Interface attributes of MIM-2VT1

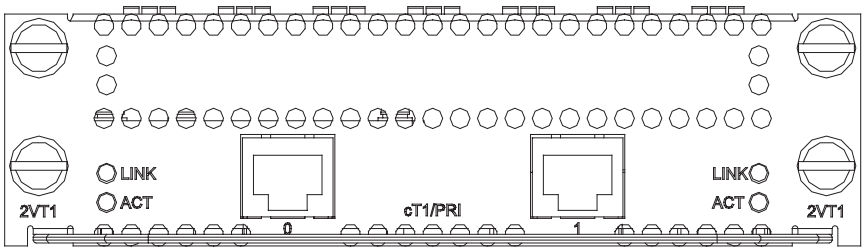
Attribute	Description
Connector	RJ45
Number of connector	2

Table 80 Interface attributes of MIM-2VT1

Attribute	Description
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm standard shielded cable)
Operation mode	CT1
	ISDN PRI
Services	Backup
	Terminal access
	ISDN

Interface LEDs MIM-2VT1 panel is shown in the following figure:

Figure 137 MIM-2VT1 panel



The following table describes the LEDs on the MIM-2VT1 panel:

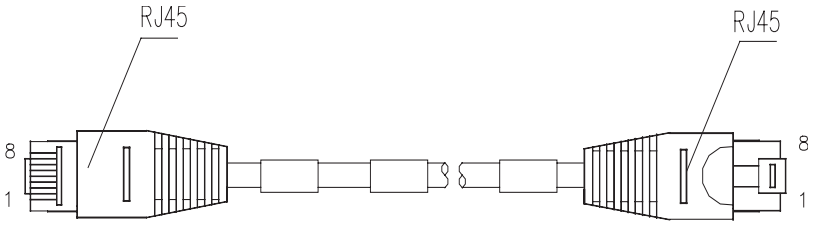
Table 81 Description of the LEDs on the MIM-2VT1 panel

LED	Description
LINK	ON means carrier signal is received;
	OFF means no carrier signal is received.
ACT	OFF: No data is being received and transmitted;
	Blinking: Data is being received and transmitted.

The MIM-2VT1 module is 1U in height, occupying two slots.

Interface Cable The interface cable of MIM-2VT1 is a standard 100-ohm standard shielding cable. The connectors on the two ends use RJ 45. The following figure illustrates this type of cable.

Figure 138 T1 cable



For the pinouts of T1 cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *The corresponding cables are not included in the standard shipment package of MIM-2VT1. Please order them together with MIM-2VT1. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the card and even damage the router.*
- *When using T1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the MIM has been properly installed, follow these steps to connect the cable:

Step 1: Plug one end of T1 cable into the RJ45 connector of MIM-2VT1.

Step 2: Connect the other end of T1 cable to the peer device;

Step 3: Check the status of LINK LED on the MIM-2VT1 panel: OFF means the link is not connected. In the latter case, check the line.

MIM-1VE1 Module

Introduction

1-port E1 voice interface module (MIM-1VE1) can handle dense voice signals in VoIP system. It provides a CE1/PRI/R2 port, allowing the access of 30 channels of voice signals.

- *VCPM is provided to users together with MIM-1VE1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of MIM-1VE1.*

Interface Attributes

The interface attributes of MIM-1VE1 are given in the following table.

Table 82 Interface attributes of MIM-1VE1

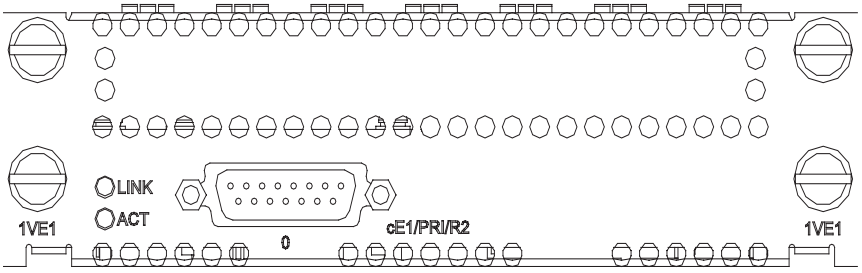
Attribute	Description
Connector	DB-15

Table 82 Interface attributes of MIM-1VE1

Attribute	Description
Number of connectors	1
Operating mode	CE1
	ISDN PRI
	R2
Interface rate	2.048 Mbps
Cable	E1 120-ohm balanced twisted pair cable
	75-ohm-to-120-ohm adapter (with BNC connector)
Supported service	1) R2 signaling
	2) DSS1 signaling
	3) IP Fax
	4) General VoIP features in Comware

Interface LEDs MIM-1VE1 panel is shown in the following figure:

Figure 139 MIM-1VE1 panel



The following table describes the LEDs on the MIM-1VE1 panel:

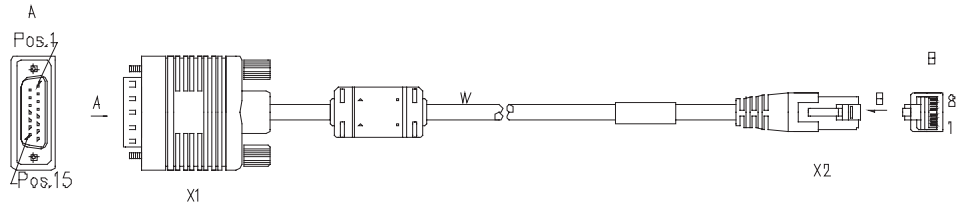
Table 83 Description of the LEDs on the MIM-1VE1 panel

LED	Description
LINK	OFF means no link is present;
	ON means a link is present.
ACT	OFF means no data is being transmitted and received.
	ON means data is being transmitted and received.

The MIM-1VE1 module is 1U in height, occupying two slots.

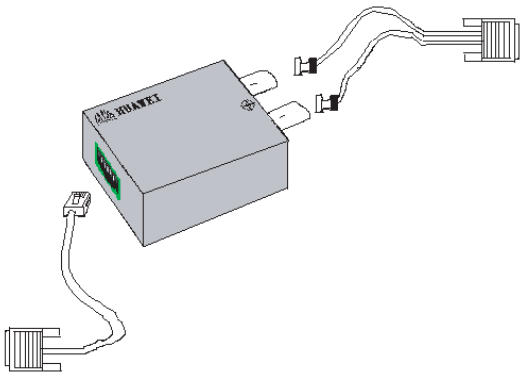
Interface Cable MIM-1VE1 interface cables are G.703-compliant 120-ohm balanced twisted pair cables. At one end of the cable is a DB-15 male connector for the connection to the Router, and at the other end is an RJ-45 connector for the connection to the network.

Figure 140 E1 120-ohm balanced twisted pair cable



If the cable with the resistance of 75-ohm is needed, a 75-ohm-to-120-ohm cable adapter (one end is BNC connector and the other end is RJ-45 connector) which is illustrated in the following figure can be installed.

Figure 141 75-ohm-to-120-ohm adapter (with BNC connector)



For cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual*.

- *For the convenience of extending the connection of E1 120-ohm balanced twisted pair cable, you can use network interface connector.*
- *E1 120-ohm balanced twisted pair cable, network interface connector, 75-ohm-to-120-ohm adapter are optional accessories. Please select one when purchasing a MIM-1VE1 module; by default, they are not provided.*

Connecting the Interface Cable

CAUTION:

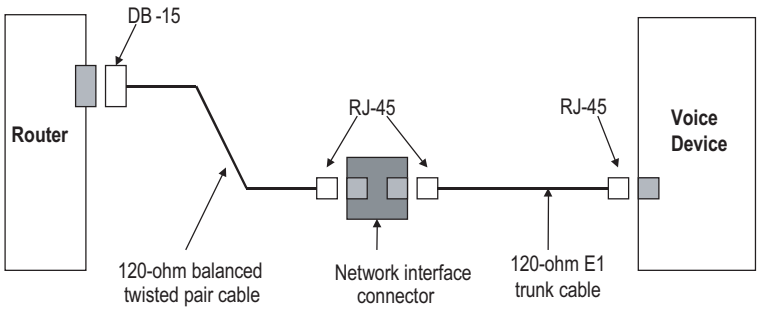
- *Some measures are taken to protect MIM-1VE1 module. Still, you are recommended to install a special lightning arrester at the input end of its connection cable to obtain better lightning protection when the cable is led outdoors;*
- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage the MIM and even the Router.*

Step 1: Plug the DB-15 connector of the cable into the DB-15 port on the MIM-1VE1 module and fasten the screws;

Step 2: Connect the RJ-45 connector of the cable to:

- The peer device directly, if the resistance of the port to be connected is 120-ohm, and there is no need to extend the cable;
- A network interface connector and then the peer device using another E1 120-ohm balanced twisted pair cable, if the resistance of the port to be connected is 120-ohm, and there is a need to extend the cable, as illustrated in the following figure.

Figure 142 Extending E1 120-ohm balanced twisted pair cable



- The peer device using a 75ohm-to-120ohm adapter, if the resistance of the peer device is 75-ohm;

Step 3: Check the behavior of the LINK LED on the MIM-1VE1 panel. It is OFF when fault has occurred on the link. In this case, please check the link.

MIM-1VT1 Module

Introduction

1-port T1 voice interface module (MIM-1VT1) can handle dense voice signals in VoIP system.

MIM-1VT1 module is structured in the form of board plus VCPM card plus VPM strip. It provides a CT1/PRI port, allowing the access of 24 channels of voice signals.

- *VCPM is provided to users together with MIM-1VT1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of MIM-1VT1.*

Interface Attributes

The interface attributes of MIM-1VT1 are given in the following table.

Table 84 Interface attributes of MIM-1VT1

Attribute	Description
Connector	RJ45
Number of connector	1
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403

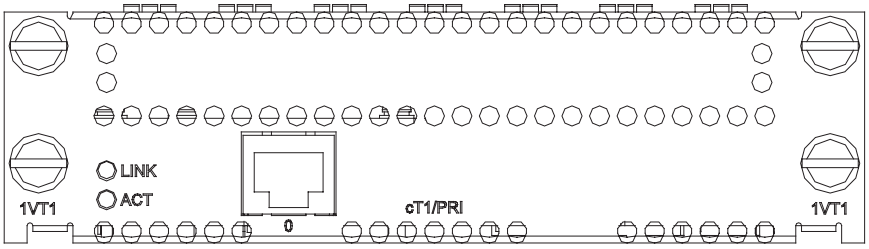
Table 84 Interface attributes of MIM-1VT1

Attribute	Description
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm standard shielded cable)
Operation mode	CT1
	ISDN PRI
Services	Backup
	Terminal access
	ISDN

Interface LEDs

MIM-1VT1 panel is shown in the following figure:

Figure 143 MIM-1VT1 panel



The following table describes the LEDs on the MIM-1VT1 panel:

Table 85 Description of the LEDs on the MIM-1VT1 panel

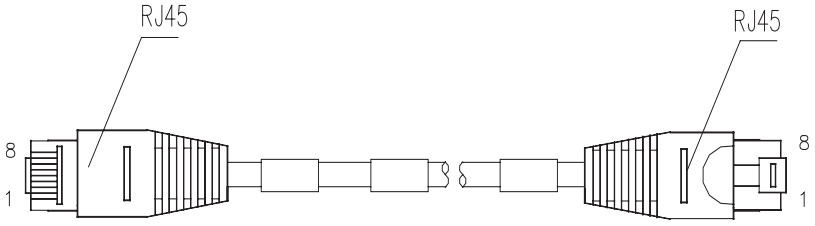
LED	Description
LINK	ON means carrier signal is received;
	OFF means no carrier signal is received.
ACT	OFF: No data is being received and transmitted;
	Blinking: Data is being received and transmitted.

The MIM-1VT1 module is 1U in height, occupying two slots.

Interface Cable

The interface cable of MIM-1VT1 is a standard 100-ohm standard shielding cable. The connectors on the two ends use RJ 45. The following figure illustrates this type of cable.

Figure 144 T1 cable



For the pinouts of T1 cables, see *Low-End and Mid-Range Series Routers Cable Manual*.

CAUTION: *The corresponding cables are not included in the standard shipment package of MIM-1VT1. Please order them together with MIM-1VT1. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the card and even damage the router.*
- *When using T1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the MIM has been properly installed, follow these steps to connect the cable:

Step 1: Plug one end of T1 cable into the RJ45 connector of MIM-1VT1.

Step 2: Connect the other end of T1 cable to the peer device;

Step 3: Check the status of LINK LED on the MIM-1VT1 panel: OFF means the link is not connected. In the latter case, check the line.

MIM-16FSW/MIM-16FSW-PoE/DMIM-24FSW/DMIM-24FSW-PoE

Introduction

The 16/24-port 10/100 Mbps Ethernet Layer 2 switching MIM interface modules (MIM-16FSW/MIM-16FSW-PoE and DMIM-24FSW/DMIM-24FSW-PoE) are applicable to MSR 30 series routers. A router installed with MIM-16FSW or DMIM-24FSW can work as a switching/routing integrated device on a small-sized enterprise network to connect PCs and network devices inside the network directly. MIM-16FSW-PoE/DMIM-24FSW-PoE can supply power to PDs through PoE.

The interfaces provided on the MIM-16FSW and DMIM-24FSW module are as follows:

- 16 × 10/100 Mbps RJ45 connector interfaces on the MIM-16FSW module

- 24 × 10/100 Mbps RJ45 connector interfaces on the DMIM-24FSW module
- 2 × 10/100/1000 Mbps (gigabit) RJ45 connector electrical interfaces on the DMIM-24FSW module
- 2 × SFP fiber interfaces (Fiber interfaces and gigabit electrical interfaces share the MAC layer) on the DMIM-24FSW module

The interface cards support:

- 100 meters (328.1 ft.) of transmission distance over the category-5 twisted-pair cable
- 100 meters (328.1 ft.) of transmission distance between any interfaces over the category-5 twisted-pair cable
- Operation at 100 Mbps and 10 Mbps, autosensing
- Full duplex and half-duplex, with the former in common use
- 24FSW provides two Combo interfaces as shown in Table 86. By default, the electrical interfaces take effect.

Interface Attributes

The interface attributes of the MIM-16FSW/MIM-16FSW-PoE /DMIM-24FSW/DMIM-24FSW-PoE are given in the following table:

Table 86 Interface attributes of the MIM-16FSW/MIM-16FSW-PoE/DMIM-24FSW/DMIM-24FSW-PoE

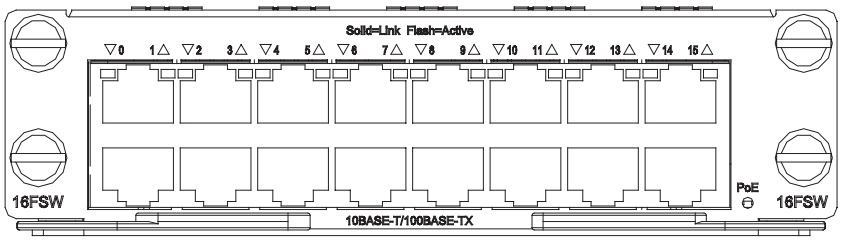
Attribute	MIM-16FSW/MIM-16FSW-PoE module	DMIM-24FSW/DMIM-24FSW-PoE module
Connector	RJ45	RJ45 + SFP fiber interface
Interface type	MDI/MDIX	MDI/MDIX + SFP fiber interface
Number of connectors	16 × 100 Mbps RJ45 connectors	24 × 100 Mbps RJ45 connectors
		Two 1000 Mbps RJ45 connectors
		Two SFP connectors
Cable type	Straight-through and crossover Ethernet cable	Straight-through and crossover Ethernet cable; Fiber interface supports SFP fiber module
Operating mode	10/100 Mbps autosensing Full/half duplex	24 × 100 Mbps electrical interface: 10/100 Mbps autosensing
		2 × gigabit electrical interface: 10/100/1000 Mbps autosensing
		2 × gigabit fiber interface: gigabit SFP fiber interface

MDI stands for Media Dependent Interface of the Ethernet. Normally, the interfaces on the network cards belong to this type. MDIX stands for Cross Media Dependent Interface, which is usually adopted on hubs or LAN switches.

Interface LEDs

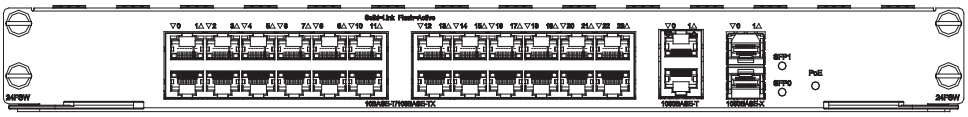
MIM-16FSW/MIM-16FSW-PoE panel is shown in the following figure:

Figure 145 MIM-16FSW/MIM-16FSW-PoE panel



DMIM-24FSW/DMIM-24FSW-PoE panel is shown in the following figure:

Figure 146 DMIM-24FSW/DMIM-24FSW-PoE panel



On the panel, each 10/100 Mbps interface corresponds to a green LED. The following table describes the status of these LEDs.

Table 87 Description of the MIM-16FSW/MIM-16FSW-PoE/DMIM-24FSW/DMIM-24FSW-PoE FE LEDs

LED status	Description
Steady green	A link is present, but no data is being transmitted and received.
OFF	No link is present.
Blinking green	A link is present and data is being transmitted and received (ACT).

The following tables describe the GE and SFP fiber interface LEDs:

Table 88 Description of the DMIM-24FSW/DMIM-24FSW-PoE GE interface LEDs

LED status	Description
OFF	No link is present.
Steady green	A gigabit link is present, but no data is being transmitted and received.
Blinking green	A gigabit link is present and data is being transmitted and received (ACT).
Steady yellow	A 100 Mbps link is present, but no data is being transmitted and received.
Blinking yellow	A 100 Mbps link is present and data is being transmitted and received (ACT).

Table 89 Description of the DMIM-24FSW/DMIM-24FSW-PoE fiber interface LEDs

LED status	Description
OFF	No link is present.
Steady green	A link is present, but no data is being transmitted and received.

Table 89 Description of the DMIM-24FSW/DMIM-24FSW-PoE fiber interface LEDs

LED status	Description
Blinking green	A link is present and data is being transmitted and received (ACT).
Steady yellow	Error prompt

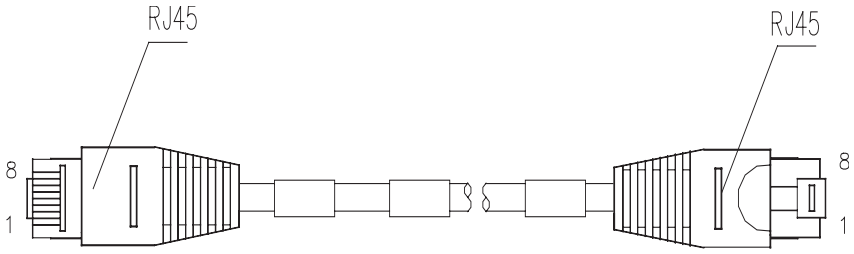
In addition, there is a POE LED on each board, which is provided for the corresponding boards (MIM-16FSW-PoE and DMIM-24FSW-PoE) with the PoE function.

- *The MIM-16FSW interface module is 1U in height, occupying two slots.*
- *The two GE interfaces on the DMIM-24FSW-PoE do not support the PoE function.*

Interface Cable

Normally, category-5 twisted pair cable is adopted to connect the 10BASE-T /100BASE-TX Ethernet interface to the Ethernet, as shown in the following figure:

Figure 147 Ethernet cable



Ethernet cables fall into two categories: straight-through cables and crossover cables, specifically,

- Straight-through cable: The sequences of the twisted pairs crimped by RJ-45 connectors at both ends are the same. It is used for the connection between a terminal device (e.g., PC and router) and a Hub/LAN Switch. The cables delivered with the Router are straight-through cables.
- Crossover cable: The sequences of the twisted pairs crimped by RJ-45 connectors at both ends are different. It is used for the connection between terminal devices (e.g., PC and router). And it can be made by the user.

For the pinouts of straight-through Ethernet cable and crossover Ethernet cable, see *Low-End and Mid-Range Series Routers Cable Manual.*

Connecting the Interface Optic Fiber

Connecting Ethernet fiber interface cable

CAUTION: *When connecting the optical fiber, observe the following*

- *Do not over-bend the optical fiber. Its curvature radius must be no less than 10 cm (3.9 in).*
- *Ensure that the Tx and Rx ends are correctly connected.*
- *Ensure that the fiber ends are clean.*

WARNING: *Laser danger: Invisible laser radiation may be emitted from the fiber-optic ports which are connected to lasers. To protect your eyes against radiation harm, never stare into an open fiber-optic port.*

Step 1: Insert the SFP optical module into its corresponding slot.

Step 2: Locate the Rx and Tx ports of the GE interface. Connect them to another device with two optical fibers: Rx to Tx and Tx to Rx.

Step 3: Check the status of LINK LED on the GE port: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

Connecting Ethernet electrical cable

Step 1: (Use a crossover cable for the connection to a PC/router and straight-through cable to a Hub/LAN Switch.) Plug one end of the cable to an Ethernet port of the Router and another end to the desired peer device;

Step 2: Check the status of LINK LED on the module panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line

MIM-IMA-4E1/MIM-IMA-8E1 Module

Introduction

The 4-port/8-port E1 ATM inverse multiplexing interface module (MIM-IMA-4E1/MIM-IMA-8E1) provides four/eight E1 interfaces that support the IMA (inverse multiplexing for ATM) technology.

The IMA technology combines multiple low-speed links into a group to support a high-speed ATM cell stream: It distributes an ATM cell stream over multiple low-speed E1 links on cell by cell basis at the transmission end and reassembles the cells on the low-speed E1 links into the original stream at the far end. This technology provides a scalable and cost-effective solution, and is commonly used in plesiochronous digital hierarchy (PDH) networks to transport ATM cells.

Interface Attributes

The following table describes the interface attributes of the MIM-IMA-4E1/MIM-IMA-8E1 module:

Table 90 Interface attributes of the MIM-IMA-4E1/ MIM-IMA-8E1

	Description			
Attribute	**MIM-IMA-4E1 (75-ohm)**	**MIM-IMA-8E1 (75-ohm)**	**MIM-IMA-4E1 (120-ohm)**	**MIM-IMA-8E1 (120-ohm)**
Connector	DB68			
Number of connectors	1			
Interface standard	ITU-G.703, ITU-G.704			
Interface rate	2.048 Mbps			

Table 90 Interface attributes of the MIM-IMA-4E1/ MIM-IMA-8E1

Attribute	Description			
	MIM-IMA-4E1 (75-ohm)	MIM-IMA-8E1 (75-ohm)	MIM-IMA-4E1 (120-ohm)	MIM-IMA-8E1 (120-ohm)
Cable type	75-ohm 4E1 conversion cable	75-ohm 8E1 conversion cable	120-ohm 4E1 conversion cable	120-ohm 8E1 conversion cable
Max transmission distance	500 m (1640.4 ft.)		150 m (492.1 ft.)	
Operating mode	ATM E1 independent link/IMA bundle mode			
Supported service	AAL5 (ATM adaptation layer 5)			
Protocol	PPPoA, PPPoEoA, IPoA, IPoEoA			
Service type	CBR/VBR-rt/VBR-nrt/UBR			

Interface LEDs

The following figures illustrate the MIM-IMA-4E1 and MIM-IMA-8E1 panels.

Figure 148 MIM-IMA-4E1 (75-ohm) panel

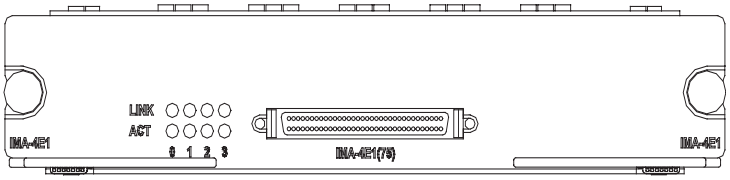
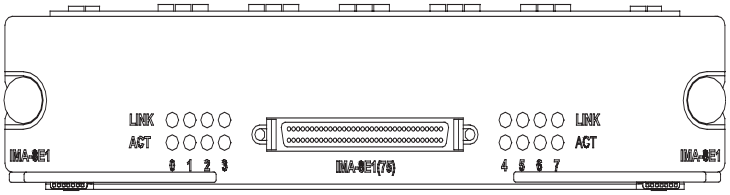


Figure 149 MIM-IMA-8E1 (75-ohm) panel



The LEDs on the MIM-IMA-4E1 panel have the same functionality as those on the MIM-IMA-8E1 panel. The following table describes these LEDs.

Table 91 Description of the LEDs on the IMA-4E1/IMA-8E1 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received. ON means data is being transmitted or received.

Interface Cable

The MIM-IMA-4E1 module provides four E1 ports and uses a 120-ohm or 75-ohm 4E1 conversion cable. The two types of 4E1 conversion cables look similar. Both of them have a DB68 connector at one end for connecting the router. However, the

75-ohm 4E1 conversion cable contains eight coaxial cables, and the 120-ohm 4E1 conversion cable contains four twisted pairs.

The MIM-IMA-8E1 module provides eight E1 ports and adopts a 120-ohm or a 75-ohm 8E1 conversion cable. The two types of 8E1 conversion cables look similar. Both of them have a DB68 connector at one end for connecting the router. However, the 75-ohm 8E1 conversion cable contains 16 coaxial cables and the 120-ohm 8E1 conversion cable contains eight twisted pairs, as shown in the following figures:

Figure 150 120-ohm 8E1 conversion cable

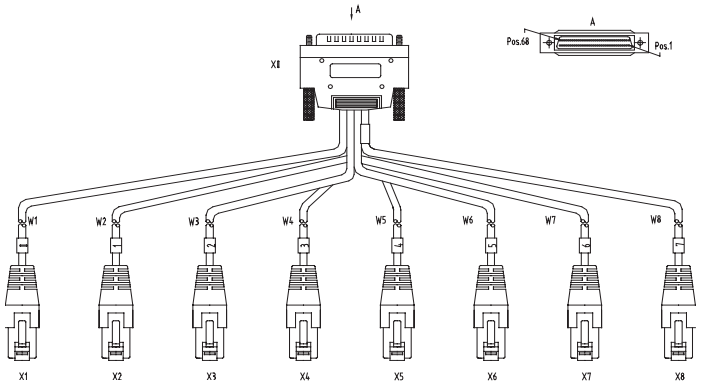
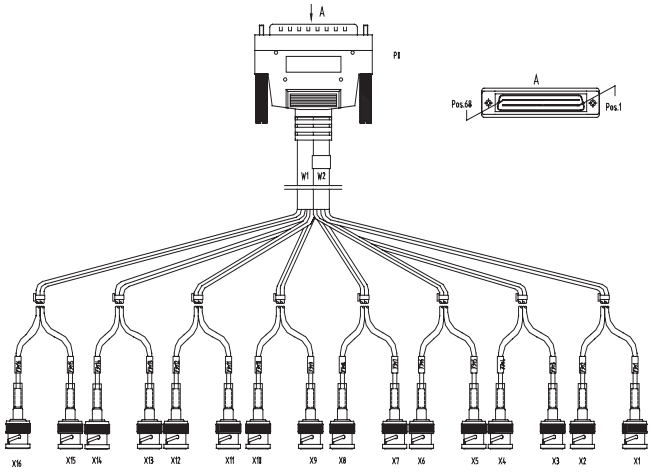


Figure 151 75-ohm 8E1 conversion cable



Connecting the Interface Cable

Follow these steps to connect the MIM-IMA-4E1/ MIM-IMA-8E1 interface cable.

Step 1: Choose a 4E1/8E1 conversion cable appropriate to the interface type of the peer device to be connected.

- If the interface impedance of the peer device is 75 ohm, use a 75-ohm 4E1/8E1 conversion cable.
- If the interface impedance of the peer device is 120 ohm, use a 120-ohm 4E1/8E1 conversion cable.

Step 2: Insert the DB68 connector at one end of the 4E1/8E1 conversion cable to the DB68 interface on the MIM-IMA-4E1/MIM-IMA-8E1 module, and fasten the cable retaining screws.

Step 3: Identify the sequence numbers of the connectors at the other end of the 4E1/8E1 conversion cable and connect one connector (or a pair of connectors) to the peer device.

Step 4: Power on the router. Check the status of the LINK LED on the MIM-IMA-4E1/ MIM-IMA-8E1 module panel. OFF means the line has problem and signal is out of synchronization. In this case, please check the line.

MIM-IMA-4T1/MIM-IMA-8T1 Module

Introduction

The 4-port/8-port T1 ATM inverse multiplexing interface module (MIM-IMA-4T1/MIM-IMA-8T1) provides four/eight T1 interfaces that support the IMA technology. Their network application is similar to that of the MIM-IMA-4E1/MIM-IMA-8E1 module.

Interface Attributes

The following table describes the interface attributes of the MIM-IMA-4T1/MIM-IMA-8T1 module.

Table 92 Interface attributes of MIM-IMA-4T1/MIM-IMA-8T1

	Description	
Attribute	**MIM-IMA-4T1**	**MIM-IMA-8T1**
Connector	DB68	
Number of connectors	1	
Interface standard	ITU-G.703, ITU-G.704	
Cable type	4T1 conversion cable (100-ohm straight-through shielded)	8T1 conversion cable (100-ohm straight-through shielded)
Max transmission distance	150 m (492.1 ft.)	
Operating mode	ATM T1 independent link/IMA bundle mode	
Supported service	AAL5	
Protocol	PPPoA, PPPoEoA, IPoA, IPoEoA	
Transmission rate	CBR/VBR-rt/VBR-nrt/UBR	

Interface LEDs

The following figures illustrate the MIM-IMA-4T1 and MIM-IMA-8T1 panels.

Figure 152 MIM-IMA-4T1 panel

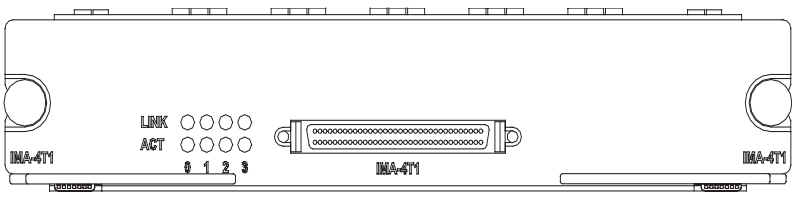
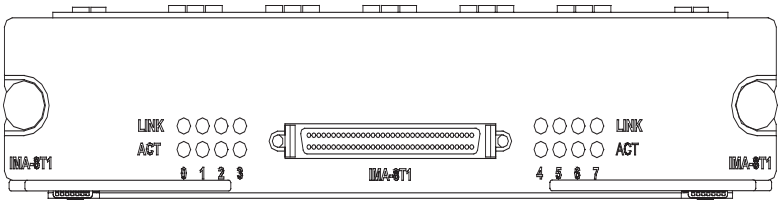


Figure 153 MIM-IMA-8T1 panel



LEDs on MIM-IMA-4T1 and MIM-IMA-8T1 panels have the same meanings, which are described in the following table.

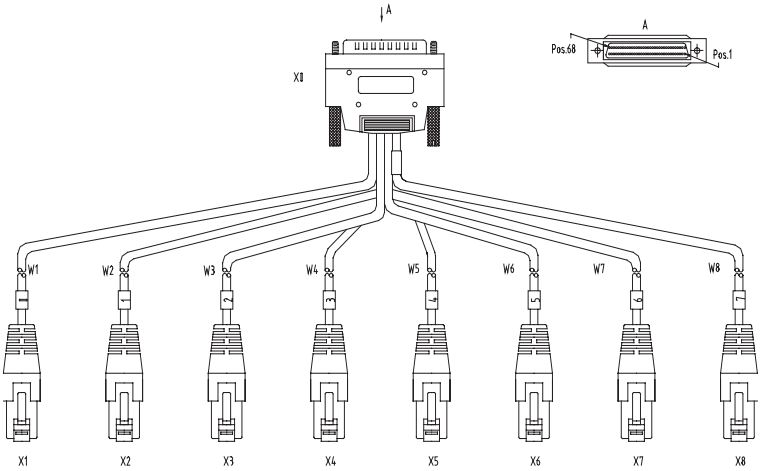
Table 93 Description of the LEDs on the MIM-IMA-4T1/MIM-IMA-8T1 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received. ON means data is being transmitted or received.

Interface Cable

The following figure illustrates an 8T1 conversion cable.

Figure 154 8T1 conversion cable



The MIM-IMA-4T1 module provides four T1 ports and uses a 4T1 conversion cable. At one end of the cable is a DB68 connector for connecting the router and at the other end are four RJ45 connectors for connecting other devices.
MIM-IMA-8T1 provides eight T1 ports and uses an 8T1 conversion cable.

Connecting the Interface Cable

Follow these steps to connect MIM-IMA-4T1/MIM-IMA-8T1 interface cable.

Step 1: Insert the DB68 connector at one end of the 4T1/8T1 conversion cable to the DB68 interface on the MIM-IMA-4T1/ MIM-IMA-8T1 module.

Step 2: Connect one RJ45 connector at the other end of the cable to a peer device.

Step 3: Power on the router. Check the status of the LINK LED on the module panel. OFF means the link is in trouble and signal is out of synchronization. In this case, please check the link.

MIM-2BSV/MIM-4BSV Module

Introduction

MIM-2BSV (MIM-4BSV) is short for 2-port (4-port) ISDN BRI S/T voice interface module, which is mainly used to process ISDN voice traffic. In the upstream direction, it can be connected to user interfaces on an ISDN switch to receive and decompress, compress and transmit ISDN BRI digital voice traffic. In the downstream direction, the card can be connected to TE devices to allow their voice traffic to be forwarded through a WAN interface on the router to the Internet, thus implementing VoIP. The interfaces on the MIM-2BSV/MIM-4BSV module are ITU-T I.430-compliant, adopting pseudo-ternary coding, providing 192 Kbps rate, and allowing the maximum transmission distance of 1 km (0.6 mi.) in point-to-point mode. MIM-2BSV/MIM-4BSV has the following features.

- The BSV interfaces support two modes: user and network, respectively for connecting an ISDN network and a TE device.
- When a BSV interface works in network mode, traffic is processed as follows: The digital voice traffic received on the BSV interface is compressed and forwarded through the CPU on the main control board to a WAN interface. The IP voice traffic received on a WAN interface is forwarded through the CPU on the main control board to MIM-2BSV/MIM-4BSV, where the traffic is decompressed and sent to the TE device.
- When a BSV interface works in user mode, traffic is processed as follows: The digital voice traffic received from the B channels on the BSV interface is decompressed and forwarded through the CPU on the main control board to a local FXS or FXO analog voice interface. The voice signals received on the local FXS or FXO analog voice interface are processed by VoIP and forwarded through the CPU on the main control board to the MIM-2BSV/MIM-4BSV module, where the traffic is compressed and sent out of the BSV interface to the connected ISDN switch.
- Working in conjunction with the FXS or FXO analog voice interface modules, MIM-2BSV/MIM-4BSV provides flexibility in voice call routing.
- The signaling on the ISDN BRI D channel is processed separately on CPU.
- The BSV interfaces support remote power supply and thus can be directly connected to ISDN phones.
- MIM-2BSV/MIM-4BSV is dedicated to voice applications, which is different from the BS interface cards where BRI data applications are supported.

Interface Attributes

Table 94 Interface attributes of MIM-2BSV/MIM-4BSV

Attribute	MIM-2BSV module	MIM-4BSV module
Connector	RJ45	
Number of connectors	2	4
Interface standard	ITU-T I.430, Q.921, Q.931	

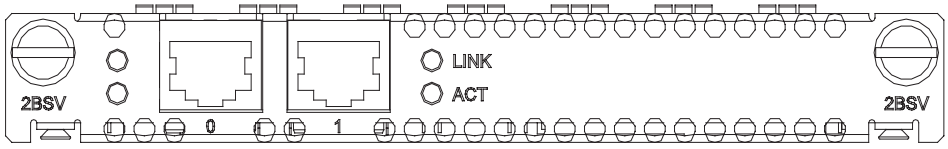
Table 94 Interface attributes of MIM-2BSV/MIM-4BSV

Attribute	MIM-2BSV module	MIM-4BSV module
Interface rate	192 Kbps	
Cable	ISDN S interface cable	
Supported service	Voice access over ISDN S interface cable	

Interface LEDs

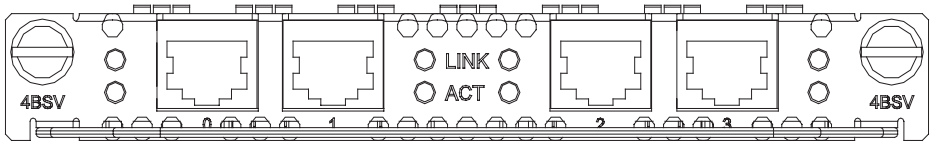
The following figure illustrates the MIM-2BSV panel.

Figure 155 MIM-2BSV panel



The following figure illustrates the MIM-4BSV panel.

Figure 156 MIM-4BSV panel



The following table describes the LEDs on the MIM-2BSV/MIM-4BSV panel.

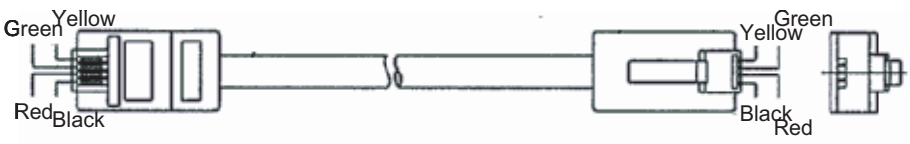
Table 95 Description of the LEDs on the MIM-2BSV/MIM-4BSV panel

LED	Description
LINK	OFF means no link is present.
	ON means a link is present.
ACT	Slowly blinking means data is being transmitted or received on B1 channel.
	Fast blinking means data is being transmitted or received on B2 channel.
	Steady ON means data is being transmitted or received on both B1 and B2 channels.
	Steady OFF means no data is being transmitted or received.

Interface Cable

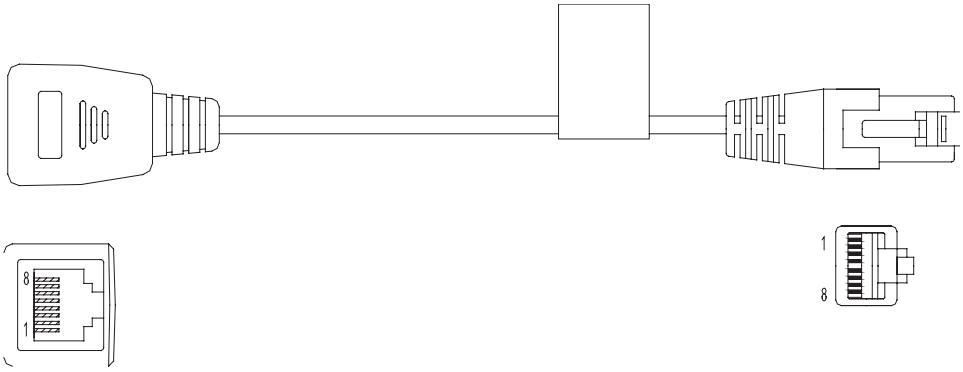
When a BSV interface works in user mode, it uses a straight-through ISDN S/T interface cable for connection. At both ends of the cable are RJ-45 connectors with pins 3 and 6 for data transmission and pins 4 and 5 for data receiving.

Figure 157 Straight-through ISDN S/T cable



When a BSV interface works in network mode, it uses a crossover ISDN S/T interface cable for connection, with pins 3 and 6 for data transmission and pins 4 and 5 for data receiving. At one end of the cable is an RJ-45 plug for connecting the BSV interface and at the other end of the cable is an RJ-45 receptacle for connecting a TE device.

Figure 158 Crossover ISDN S/T cable



Connecting the Interface Cable

CAUTION:

- *If outdoor cabling is involved, you need to install a special lightning arrester at the input end of the ISDN BRI S/T interface cable to avoid lightning strike.*
- *When connecting the interface cable, pay attention to the mark on the interface to avoid wrong insertion, which may damage the interface card or even the router host.*

Step 1: Identify the operating mode of the BSV interface. If the interface is to be connected to an ISDN network, it should operate in user mode; if the interface is to be connected to a TE device, such as a digital phone or another BSV interface in user mode, the interface should operate in network mode.

Step 2: Connect the cable.

1. To connect the module to an ISDN network, identify the type of the ISDN line provided by your telecommunications service provider.
   - If it is an ISDN U interface line, use an NT1 for conversion. Insert one end of the S/T interface cable into the S/T interface on the NT1 and the other end to a BSV interface on the MIM-2BSV/MIM-4BSV.
   - If it is an ISDN S/T interface line, directly connect the cable to a BSV interface on the MIM-2BSV/MIM-4BSV.
2. To connect the module to a TE device, use a crossover S/T interface cable. Connect the RJ-45 plug at one end of the cable to the MIM-2BSV/MIM-4BSV interface, the RJ-45 receptacle to the straight-through S/T interface cable, and then the straight-through cable to the TE device.

MIM-1CPOS Module

Introduction

MIM-1CPOS is short for the 1-port channelized SDH/SONET interface module. C stands for Channelized, and POS for Packet over SDH/SONET. MIM-1CPOS provides one STM-1/OC3-compliant multi-channel interface and support communication speeds up to 155.52 Mbps.

MIM-1CPOS has two models: MIM-1CPOS(E) for E1 system and MIM-1CPOS(T) for T1 system.

MIM-1CPOS is inserted in a MIM slot of a modular router and communicates with the CPU through the PCI interface to receive and transmit data on STM-1 channelized POS interface. It supports:

- Four types of hot-swappable SFP optical interface modules for your choice: multi-mode short-haul (1310 nm), single-mode medium-haul (1310 nm), single-mode long-haul (1310 nm), and single-mode ultra-long-haul (1550 nm).
- Clear channel (unframed) E1 or T1
- Fractional (framed) E1 or T1
- Up to 256 64 kbps logical channels

Interface Attributes

The following table describes the interface attributes of MIM-1CPOS(E)/ MIM-1CPOS(T).

Table 96 Interface attributes of the MIM-1CPOS(E)/MIM-1CPOS(T) module

Attribute		**MIM-1CPOS(E)/MIM-1CPOS(T)**			
Connector		SFP/LC			
Number of Connectors		1			
Interface standard		SONET OC-3/SDH STM-1			
Interface rate		155.52 Mbps			
Optical transmitter power	Type	Multi-mode short-haul	Single mode medium-haul	Single mode long-haul	Single mode ultra-long-haul
	Min.	-19.0 dBm	-15.0 dBm	-5.0 dBm	-5.0 dBm
	Max.	-14.0 dBm	-8.0 dBm	0. dBm	0. dBm
Receiver sensitivity		-30.0 dBm	-28.0 dBm	-34.0 dBm	-34.0 dBm
Overload optical power		-14.0 dBm	-7.0 dBm	-9.0 dBm	-10.0 dBm
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Max. transmission segment		2 km (1.2 mi.)	15 km (9.3 mi.)	40 km (24.9 mi)	80 km (49.7 mi)
Fiber type		62.5/125 μm multi-mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode

CAUTION: *For a long-haul fiber-optic interface, the transmission distance must be longer than 25 km (15.5 in.) to allow the receiver to work. In case of closer distances, insert an optical attenuator to reduce the input optical power.*

Interface LEDs

The following figures illustrate the MIM-1CPOS(E) and MIM-1CPOS(T) panels:

Figure 159 MIM-1CPOS(E) front panel

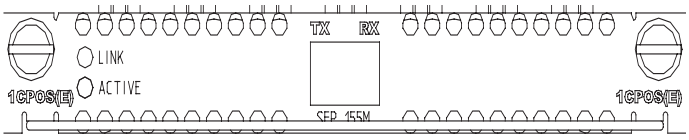
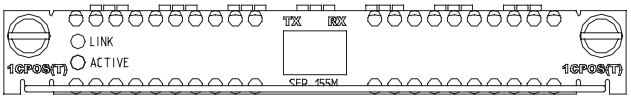


Figure 160 MIM-1CPOS(T) front panel



The following table describes the LEDs on the MIM-1CPOS(E)/MIM-1CPOS(T) panel.

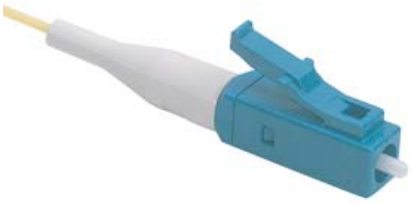
Table 97 LEDs on the MIM-1CPOS(E)/MIM-1CPOS(T) panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or transmitted.

Interface Optical Fiber

The MIM-1CPOS module can only be connected with an optical fiber cable with an LC-type fiber-optic connector.

Figure 161 LC-type fiber-optic connector



Fiber-optic connectors, according to ITU, are passive components used to stably but not permanently connect two or more optical fibers. They are indispensable to a fiber-optic communications system in the sense that it allows add/drop connections between optical channels.

There are many types of fiber-optic connectors, such as

- *FC: round fiber-optic connector with screw thread*

- *ST: round plug-in fiber-optic connector*
- *LC: square fiber-optic connector*
- *MT-RJ: square fiber-optic transceiver connector*

Connecting the Interface Optical Fiber

Step 1: Insert the SFP module into the corresponding slot.

Step 2: Locate the Rx and Tx optic interfaces on the module. Use two fiber cables to connect the MIM-1CPOS to the peer device: Rx to Tx and Tx to Rx.

Step 3: Check the status of the LINK LED for the MIM-1CPOS module: ON means the Rx link is present and OFF means the opposite. In the latter case, check the line.

WARNING: *Because invisible laser radiation may be emitted from the aperture of an optical port when no fiber is connected or the dust cap is removed, do not stare into the open aperture.*

Replace the dust cap when no fiber is connected to the optical port.

MIM-1SHL-4W Module

Introduction

The 1-port dual-pair G.SHDSL interface module (MIM-1SHL-4W) adopts trellis coded pulse amplitude modulation (TCPAM) coding and provides symmetric rates up to 4.624 Mbps. The transmission rate of the interface can automatically adapt to line distances and conditions.

Compared with ADSL, G.SHDSL allows farther transmission distance and thus has a wider application scope. It is an alternative to E1/T1 line for high-speed data service access. However, as TCPAM uses the band starting from 0 Hz for data transmission, G.SHDSL cannot share the same line with POTS or ISDN like what ADSL has done.

The MIM-1SHL-4W delivers these features:

- Supporting manual G.SHDSL line activation/deactivation and easy-to-use fault location tools.
- Supporting G.991.2 interface standard and auto-sensing.
- Allowing you to set the dual-pair G.SHDSL interface to operate in dual-pair or single-pair mode.

Interface Attributes

Table 98 Interface attributes of the MIM-1SHL-4W

Attribute	MIM-1SHL-4W
Connector	RJ-11
Number of connectors	1
Interface standard	ITU-T G991.2
	ITU-T G994.1 handshaking

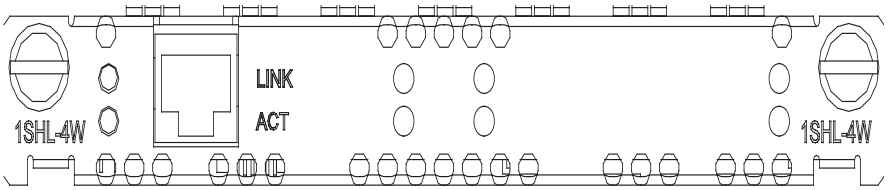
Table 98 Interface attributes of the MIM-1SHL-4W

Attribute	MIM-1SHL-4W
Interface rate	In single-pair mode, supports the sending and receiving independent symmetric rates in the range from 192 kbps to 2312 kbps in steps of 8 kbps.
	In dual-pair mode, supports the sending/receiving independent symmetric rates in the range from 384 kbps to 4624 kbps in steps of 16 kbps.
Interface cable	Tailor-made 4-wire telephone cable
Supported services	G.SHDSL access over ordinary telephone lines

Interface LEDs

The following figure illustrates the MIM-1SHL-4W panel:

Figure 162 MIM-1SHL-4W panel



The following table describes the LEDs on the MIM-1SHL-4W panel.

Table 99 LEDs on the MIM-1SHL-4W panel

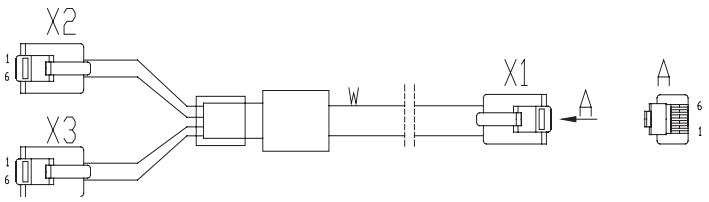
LED	Description
LINK	OFF means no link is present.
	ON means a link is present.
ACT	OFF means no data is being transmitted or received.
	Blinking means data is being received or transmitted.

Interface Cable

MIM-1SHL-4W uses a tailor-made 4-wire telephone cable of type "Y" or "I". You can select the type as needed.

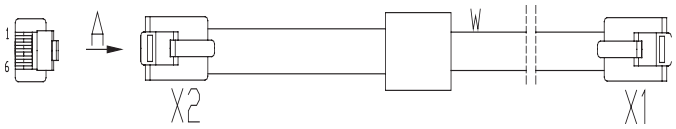
- As shown in the following figure, on one end of the type "Y" G.SHDSL cable there is one RJ-11 connector (X1), which is used to connect the MIM-1SHL-4W module; on the other end there are two RJ-11 connectors (X2 and X3), which can connect two 2-wire telephone lines. Pins 3 and 4 of X1 are connected with pins 3 and 4 of X2, and pins 2 and 5 of X1 are connected with pins 3 and 4 of X3.

Figure 163 Type "Y" cable



- As shown in the following figure, on both ends of the "I" type G.SHDSL cable there is an RJ-11 connector. The "I" type G.SHDSL cable can connect one 4-wire telephone cable.

Figure 164 "I" type cable



Connecting the Interface Cable

- When using the "Y" cable, connect the X1 end of the cable to the interface on MIM-1SHL-4W and connect the other two ends (X2, X3) to DSLAM through PSTN.
- When using the "I" cable, connect one end of the cable to the interface on MIM-1SHL-4W and the other end to DSLAM through PSTN.

XMIM-16FSW/XMIM-24FSW

Introduction

XMIM-16FSW and XMIM-24FSW are a 16-port 10/100 Mbps Ethernet Layer 2 switching MIM interface card and a 24-port 10/100 Mbps Ethernet Layer 2 switching MIM interface card, which can be installed on the MSR 30-11. Each XMIM-16FSW provides sixteen ordinary 10/100 Mbps RJ45 connector interfaces, while each XMIM-24FSW provides twenty-four 10/100 Mbps RJ45 connector interfaces. Both XMIM-16FSW and XMIM-24FSW are suitable for a small enterprise network to serve as a switching & routing device, which can be directly connected to PCs and network devices of the enterprise. XMIM-16FSW and XMIM-24FSW support the following functions:

- A transmission distance of 100 meters (328.1 ft.) when connected with a category-5 twisted pair cable (crossover or straight-through cable).
- 100 Mbps wire-speed forwarding between any ports when connected with a category-5 twisted pair cable (crossover or straight-through cable).
- Auto-sensing at a rate of 10 Mbps or 100 Mbps.
- Full duplex and half duplex, of which full duplex is common.

Interface Attributes

Table 100 Interface attributes of XMIM-16FSW/XMIM-24FSW

Attributes	XMIM-16FSW/XMIM-24FSW
Connector type	RJ45
Interface type	MDI/MDIX

Table 100 Interface attributes of XMIM-16FSW/XMIM-24FSW

Attributes	XMIM-16FSW/XMIM-24FSW
Number of connectors	16 × 100 Mbps RJ45 connector/24 × 100 Mbps RJ45 connector
Cable type	Standard (straight-through) Ethernet cable/crossover Ethernet cable
Operation mode	Auto-sensing 10M/100 Mbps, full duplex/half duplex

Ethernet interfaces on network adapters are usually medium dependent interfaces (MDIs). Cross medium dependent interfaces (MDIXs) are another type of Ethernet interfaces, which are usually used on hubs and LAN Switches.

Interface LEDs

Figure 165 shows the XMIM-16FSW panel.

Figure 165 XMIM-16FSW panel

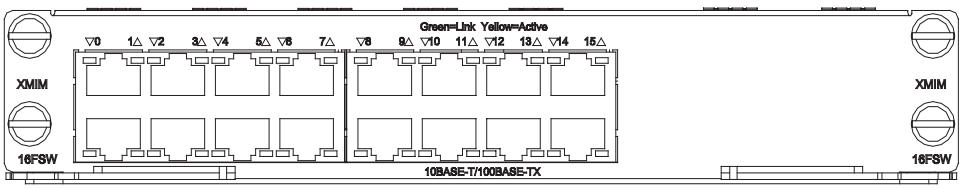
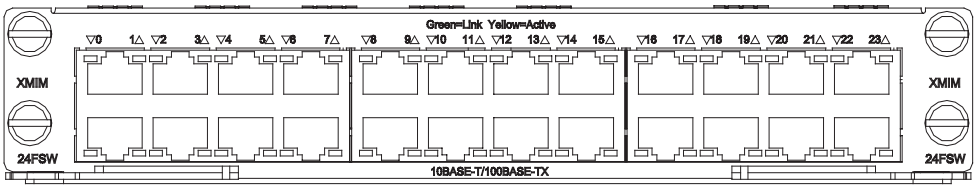


Figure 166 shows the XMIM-24FSW panel.

Figure 166 XMIM-24FSW panel



Each 10/100 Mbps Ethernet interface on the panel has two corresponding LEDs. One is yellow and the other is green. Table 101 describes these LEDs.

Table 101 LEDs of the XMIM-16FSW/XMIM-24FSW FE port

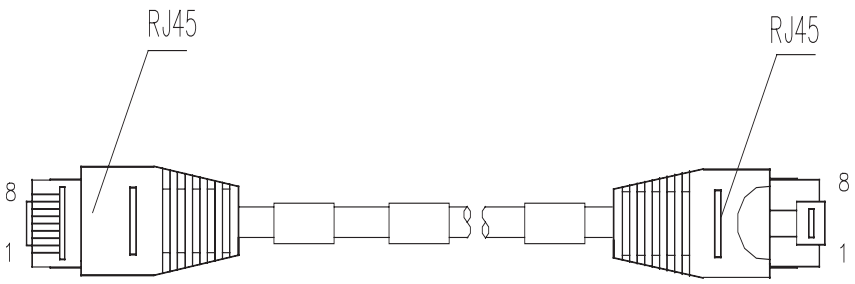
LED status	Description
Green LED (LINK)	ON: A link is present.
	OFF: No link is present.
Yellow LED (ACT)	Blinking: Data is being received and sent on the port.
	OFF: No data is being received or sent on the port.

XMIM-16FSW and XMIM-24FSW are both 1U (44.45 mm, namely, 1.75 in.) in height and each occupy two slots (the upper slot and the lower slot).

Interface Cable

10BASE-T, 100BASE-TX, and gigabit Ethernet interfaces are connected to Ethernet networks with Ethernet cables, usually category-5 twisted pair cables. Figure 167 shows the appearance of an Ethernet cable.

Figure 167 Ethernet cable



Ethernet cables fall into standard (straight-through) cables and crossover cables.

- Standard cable: The sequences of colored wires at the two RJ45 connectors crimped to the twisted pair cable are completely the same. Standard cables are used to connect terminal devices such as PC and router to hubs or LAN Switches.
- Crossover cable: The sequences of colored wires at the two RJ45 connectors crimped to the twisted pair cable are different. Crossover cables are used to connect terminal devices such as PC and router to terminal devices.

For the connection, identification, and preparation of these two types of cables, refer *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting an Interface Cable

Follow the steps below to connect an interface cable:

1. If you want to connect the router to a PC or another router, use a crossover cable. If you want to connect the router to a hub or LAN Switch, use a straight-through cable. Connect one end to an Ethernet interface of the router and the other end to the PC, the other router, the hub, or the LAN switch.
2. Check the status of the LEDs on the panels after power-on. If the LINK LED is ON, a link is present. If the LINK LED is OFF, no link is present and in this case you should check the line.

4 FLEXIBLE INTERFACE CARDS

For modular MSR series routers, a wide range of optional flexible interface cards/double flexible interface cards (FICs/DFICs) are available, which provide abundant interfaces, such as synchronous/asynchronous serial interface, Ethernet interface, E1/T1, ISDN BRI/PRI, audio interface, Layer 2 switching interface, and so on.

Among this series interface cards, the Layer 2 switching interface cards (FIC-16FSW and DFIC-24FSW) each have a corresponding PoE-capable one, which can provide -48 VDC power to remote PDs (such as IP phone, WLAN AP, and network camera) through straight-through network cables as long as installed on a PoE router.

FIC-1FE/FIC-2FE/FIC-4FE

Introduction

The 1-port, 2-port, and 4-port 10Base-T/100Base-TX fast Ethernet interface cards (FIC-1FE, FIC-2FE, and FIC-4FE) are mainly used for the communication between router and LAN.

The cards support:

- 100 meters (328.1 ft.) of transmission segment over the category-5 twisted-pair cable.
- Operation at 100 Mbps and 10 Mbps, autosensing.
- Full duplex and half-duplex, with the former in common use.

Interface Attributes

The following table describes the interface attributes of the FIC-1FE/FIC-2FE/FIC-4FE cards.

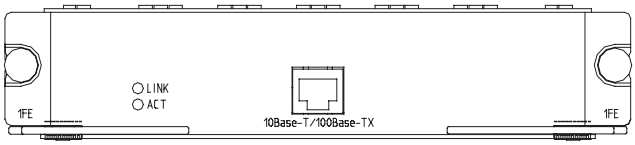
Table 102 FIC-1FE/FIC-2FE/FIC-4FE interface attributes

	Description		
Attribute	**FIC-1FE**	**FIC-2FE**	**FIC-4FE**
Connector	RJ-45		
Number of connectors	1	2	4
Cable	Straight-through Ethernet cable		
Operating mode	Full duplex/half-duplex 10/100 Mbps auto-sensing		
Supported frame format	Ethernet_II Ethernet_SNAP		

Interface LEDs

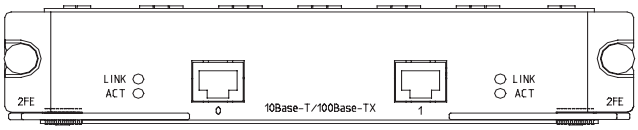
The following figure illustrates an FIC-1FE panel.

Figure 168 FIC-1FE panel



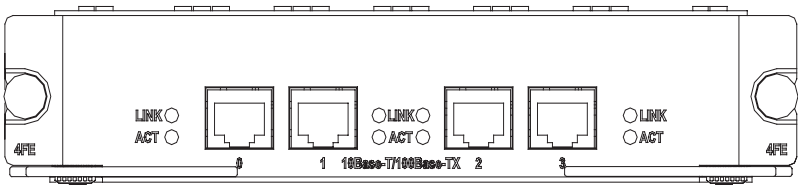
The following figure illustrates an FIC-2FE panel.

Figure 169 FIC-2FE panel



The following figure illustrates an FIC-4FE panel.

Figure 170 FIC-4FE panel



The following table describes the LEDs on the FIC-1FE/FIC-2FE/FIC-4FE panel.

Table 103 LEDs on the FIC-1FE/FIC-2FE/FIC-4FE panel

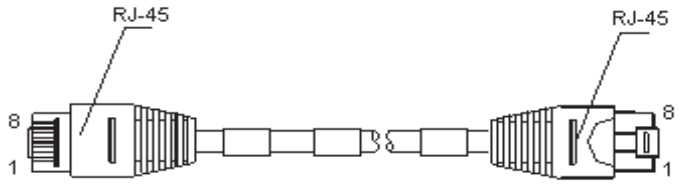
LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted and/or received.

Interface Cable

Ethernet cable

As shown in the following figure, the Ethernet cables for FIC-FE cards are category-5 twisted pairs with RJ-45 connectors. Pins 1 and 2 of the interface are used for transmitting data, and pins 3 and 6 are used for receiving data.

Figure 171 Ethernet cable



Making Ethernet cables

You can use category 5 twisted-pair cables to make Ethernet cables. A category 5 twisted-pair cable is composed of eight wires that are identified and grouped by colors of the outer insulator. Usually a solid color wire and a white/solid color wire are organized in pairs. But sometimes, wires are also paired by color dots.

Ethernet cables fit into two categories: straight-through and crossover.

- Straight-through cable: The wires are crimped in the RJ-45 connectors at both ends in the same order. The cable is used for connecting a terminal device (for example, PC or router) to a HUB or LAN switch. The cables delivered with the router are straight-through cables.
- Crossover cable: The wires are crimped in the RJ-45 connectors at both ends in different orders. The cable is used for connecting two terminal devices (for example, PC and router). You can make cables as needed.

In making network cables, shielded cables are preferred for electromagnetic compatibility sake.

The interface cables in the standard package of RT-FIC-FE cards are straight-through cables.

Connecting the Interface Cable

Step 1: Plug one end of the cable to an Ethernet port on the router and another end to the device to be connected. (For a PC or router, use a straight-through cable; for a HUB or LAN switch, use a crossover cable.)

Step 2: Power on the router and check the behavior of the LINK LED on the FIC-FE panel: ON means that a link is present and OFF means that no link is present. In the latter case, check the line status.

CAUTION: *Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.*

FIC-1GBE/FIC-2GBE

Introduction

FIC-1GBE/FIC-2GBE, the 1-port/2-port 10Base-T/100Base-TX/1000Base-T Ethernet electrical interface card, is used for router-to-LAN communication.

The cards support:

- 100 meters (328.1 ft.) of transmission segment over the category-5 twisted-pair cable.

- Operation at 1000 Mbps, 100 Mbps, and 10 Mbps, auto-sensing.
- Half-duplex/full duplex, autosensing

Interface Attributes

The following table describes the interface attributes of the FIC-1GBE/FIC-2GBE:

Table 104 Interface attributes of the FIC-1GBE/FIC-2GBE

Attribute	FIC-1GBE	FIC-2GBE
Connector	RJ-45	
Number of connectors	1	2
Interface type	MDI/MDIX	
Interface standard	802.3, 802.3u, and 802.3ab	
Cable type	Ethernet cable	
Operating mode	10/100/1000 Mbps auto-sensing Half-duplex/full duplex, autosensing	

Interface LEDs

The following figures show the FIC-1GBE and FIC-2GBE panels.

Figure 172 FIC-1GBE panel

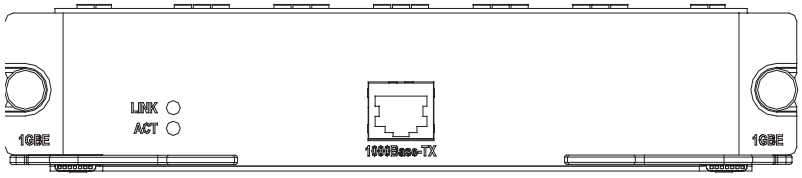
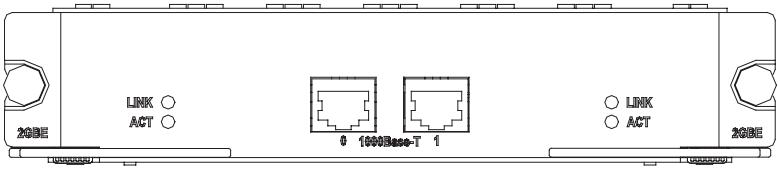


Figure 173 FIC-2GBE panel



The following table describes the LEDs on the FIC-1GBE/FIC-2GBE panel.

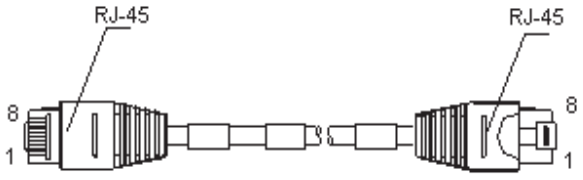
Table 105 LEDs on the FIC-1GBE/FIC-2GBE panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received. Blinking means data is being transmitted and/or received.

Interface Cable

FIC-1GBE/FIC-2GBE uses both crossover and straight-through cables for connection.

Figure 174 Ethernet cable



Connecting the Interface Cable

Step 1: Connect one end of the cable to the Ethernet interface on the router and the other end to another device.

Step 2: Power on the router and check the behavior of the LINK LED on the panel. ON means a link is present and OFF means no link is present. In the latter case, check the line status.

FIC-1GEF/FIC-2GEF

Introduction

FIC-1GEF/FIC-2GEF, the 1-port/2-port 1000Base-SX/1000Base-LX GE fiber interface card, is used for router-to-LAN communication.

The cards support:

- Five types of 1000Base-SX/1000Base-LX SFP modules: multi-mode short-haul (850 nm), single-mode medium-haul (1310 nm), single-mode long-haul (1310 nm), single mode long-haul (1550 nm), and single-mode ultra-long haul (1550 nm)
- Operation at 1000 Mbps
- Full duplex

Interface Attributes

The following table describes the interface attributes of the FIC-1GEF/FIC-2GEF:

Table 106 Interface attributes of the FIC-1GEF/FIC-2GEF

Attribute		**FIC-1GEF**			**FIC-2GEF**	
Connector		SFP				
Number of interfaces		1			2	
Interface standard		802.3, 802.3u, 802.3ab				
Optical transmitter power	Type	Multi-mode short-haul (850 nm)	Single-mode medium-haul (1310 nm)	Long-haul (1310 nm)	Long-haul (1550 nm)	Ultra-long haul (1550 nm)
	Min.	-9.5 dBm	-9 dBm	-2 dBm	-4 dBm	-4 dBm
	Max.	0 dBm	-3 dBm	5 dBm	1 dBm	2 dBm
Receiver sensitivity		-17 dBm	-20 dBm	-23 dBm	-21 dBm	-22 dBm
Central wavelength		850 nm	1310 nm	1310 nm	1550 nm	1550 nm

Table 106 Interface attributes of the FIC-1GEF/FIC-2GEF

Attribute	FIC-1GEF			FIC-2GEF	
Fiber type	62.5/125 μm multi-mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode
Max. transmission segment	0.55 km (0.34 mi.)	10 km (6.21 mi.)	40 km (24.86 mi.)	40 km (24.86 mi.)	70 km (43.50 mi.)
Operating mode	1000 Mbps Full duplex				

Interface LEDs

The following figures illustrate the FIC-1GEF and FIC-2GEF panels:

Figure 175 FIC-1GEF panel

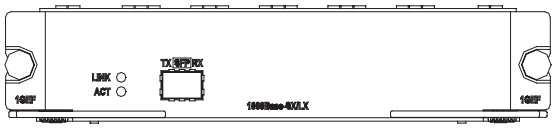
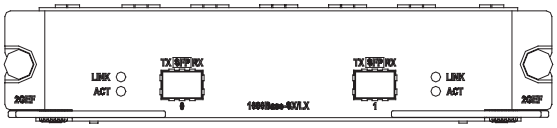


Figure 176 FIC-2GEF panel



The following table describes the LEDs on the FIC-1GEF and FIC-2GEF panels.

Table 107 LEDs on the FIC-1GEF/ FIC-2GEF panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

For FIC-1GEF and FIC-2GEF cards, select optical fibers depending on the type of the installed 1000Base-SX/1000 Base-LX SFP. As the interfaces that these SFP modules provide use LC-type fiber-optic connectors, you must use fibers with LC-type connectors for them.

Figure 177 LC-type fiber-optic connector

- *LC-type fiber-optic connectors were compact fiber-optic connectors developed by Lucent.*
- *The fibers are provided depending on the purchased SFPs. Therefore, please provide information on the SFPs when purchasing FICs; by default, the fibers are not provided.*

Connecting the Interface Optic Fiber

CAUTION: *When connecting the optical fiber, observe the following*

- *Do not over-bend the optical fiber. Its curvature radius must be no less than 10 cm (3.9 in).*
- *Ensure that the Tx and Rx ends are correctly connected.*
- *Ensure that the fiber ends are clean.*

WARNING: *Laser danger: Invisible laser radiation may be emitted from the fiber-optic ports which are connected to lasers. To protect your eyes against radiation harm, never stare into an open fiber-optic port.*

Step 1: Insert the SFP optical module into its corresponding slot.

Step 2: Locate the Rx and Tx ports of the GEF interface. Connect them to another device with two optical fibers: Rx to Tx and Tx to Rx.

Step 3: Power on the router and check the behavior of the LINK LED on the card panel. ON means an Rx link is present and OFF means the opposite. In the latter case, check the line status.

FIC-2SAE/FIC-4SAE/FIC-8SAE

Introduction

FIC-2SAE/FIC-4SAE/FIC-8SAE, 2-/4-/8-port enhanced high-speed synchronous/asynchronous serial interface card, transmits, receives, and processes data on the synchronous/asynchronous serial interface. They support both synchronous and asynchronous modes. In the former case, they support the DTE/DCE mode.

DTE and DCE

An FIC-SA card is usually connected to an external modem for dialing purpose, where an appropriate baud rate setting is required.

The synchronous serial interface can work in either DTE or DCE mode. Two directly connected devices must work as DTE and DCE respectively. The DCE provides clock synchronization and specifies the communication rate, whereas the DTE accepts clock synchronization and communicates at the specified rate.

The router normally works as a DTE. To identify whether the equipment connected to the router is DTE or DCE, refer to the manual shipped with the equipment.

Speed and transmission segment of synchronous/asynchronous serial interface

In different operating modes, the synchronous/asynchronous serial interface supports different electric signal specifications and baud rates. In addition, the maximum signal transmission segment depends not only on the specified baud rate but also on the selected cable. The following table shows how the cable type, baud rate, and the maximum signal transmission segment related to each other.

Table 108 Speed and transmission segment of the V.24 (RS232)/V.35 cable

V.24 (RS232)		V.35	
Baud rate (bps)	**Max. transmission segment**	**Baud rate (bps)**	**Max. transmission segment**
2400	60 m (196.9 ft.)	2400	1250 (4101 ft.)
4800	60 m (196.9 ft.)	4800	625 m (2050.5 ft.)
9600	30 m (98.4 ft.)	9600	312 m (1023.6 ft.)
19200	30 m (98.4 ft.)	19200	156 m (511.8 ft.)
38400	20 m 65.6 ft.)	38400	78 m (255.9 ft.)
64000	20 m (65.6 ft.)	56000	60 m (196.9 ft.)
115200	10 m (32.8 ft.)	64000	50 m (164 ft.)
-	-	2048000	30 m (98.4 ft.)

When a V.24 cable is used, the baud rate of the FIC-SA in synchronous mode shall not exceed 64 Kbps.

Interface Attributes

The following table describes the interface attributes of the FIC-SAE:

Table 109 Interface attributes of the FIC-2SAE/FIC-4SAE/FIC-8SAE

	Description	
Attribute	**Synchronous**	**Asynchronous**
Connector	DB-28	
Number of connectors	2 (FIC-2SAE) 4 (FIC-4SAE) 8 (FIC-8SAE)	

Table 109 Interface attributes of the FIC-2SAE/FIC-4SAE/FIC-8SAE

	Description			
Attribute	**Synchronous**			**Asynchronous**
Interface standard and operating mode	V.24	V.35, RS449, X.21, RS530		RS232
	DTE, DCE	DTE	DCE	
Min. baud rate(bps)	1200	1200		300
Max. baud rate(bps)	64 k	4.096 M	2.048 M	115.2
Cable	V.24 (RS232) DTE cable V.24 (RS232) DCE cable V.35 DTE cable V.35 DCE cable X.21 DTE cable X.21 DCE cable RS449 DTE cable RS449 DCE cable RS530 DTE cable RS530 DCE cable			
Supported service	1) DDN leased line 2) Terminal access service			1) Dialup through modem 2) Backup 3) Asynchronous leased line 4) Terminal access service

Interface LEDs

The following figures show the FIC-2SAE and FIC-4SAE panels:

Figure 178 FIC-2SAE panel

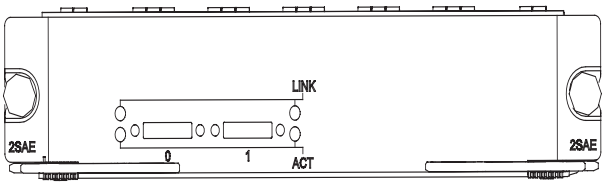
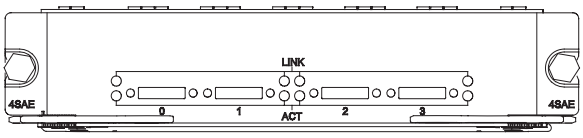


Figure 179 FIC-4SAE panel



The following table describes the LEDs on the FIC-2SAE/ FIC-4SAE panel:

Table 110 LEDs on the FIC-2SAE/FIC-4SAE panel

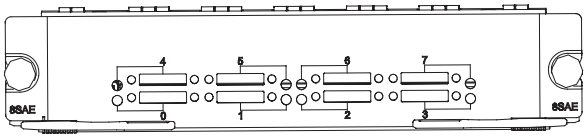
LED	**Description**
LINK	OFF means no link is present; ON means a link is present.

Table 110 LEDs on the FIC-2SAE/FIC-4SAE panel

LED	Description
ACT	OFF means no data is being transmitted or received. Blinking means data is being transmitted and/or received.

The following figure shows the FIC-8SAE panel:

Figure 180 FIC-8SAE front panel



On the FIC-8SAE panel, each link corresponds to a LED. ON means a link is present; blinking means data is being transmitted and/or received.

Interface Cable

The FIC-SAE cards use synchronous/asynchronous serial interface cables with DB-28 connectors.

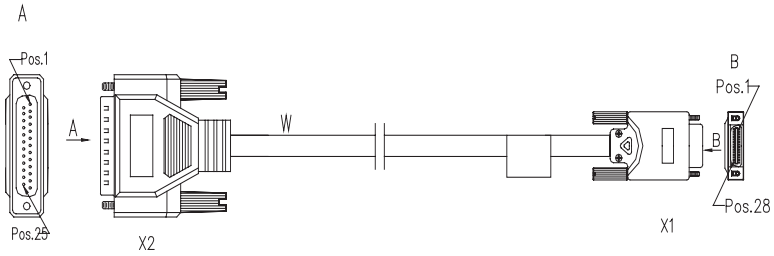
Before connecting an FIC-SAE card, identify the line properties and then select the proper interface cable from the following ten cable options:

- V.24 (RS232) DTE cable: DB-25 plug at the network end
- V.24 (RS232) DCE cable: DB-25 receptacle at the network end
- V.35 DTE cable: 34PIN plug at the network end
- V.35 DCE cable: 34PIN receptacle at the network end
- X.21 DTE cable: DB-15 plug at the network end
- X.21 DCE cable: DB-15 receptacle at the network end
- RS449 DTE cable: DB-37 plug at the network end
- RS449 DCE cable: DB37 receptacle at the network end
- RS530 DTE cable: DB-25 plug at the network end
- RS530 DCE cable: DB25 receptacle at the network end

All these cables use a DB-28 connector to connect the router, but the connector at the network end varies with the type of the to-be-connected network.

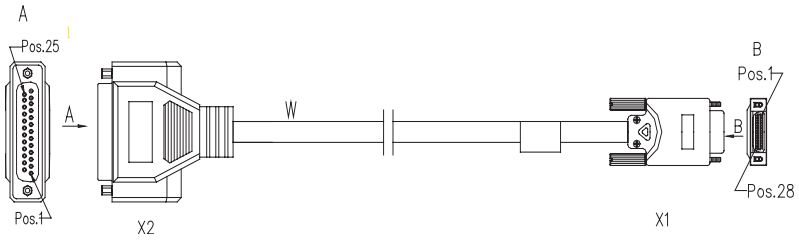
- V.24 DTE cable

Figure 181 V24 DTE cable



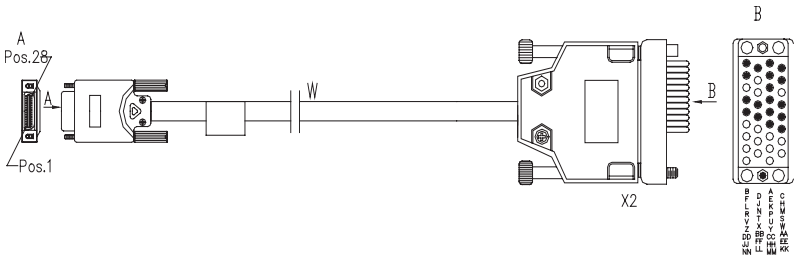
- V.24 DCE cable

Figure 182 V.24 DCE cable



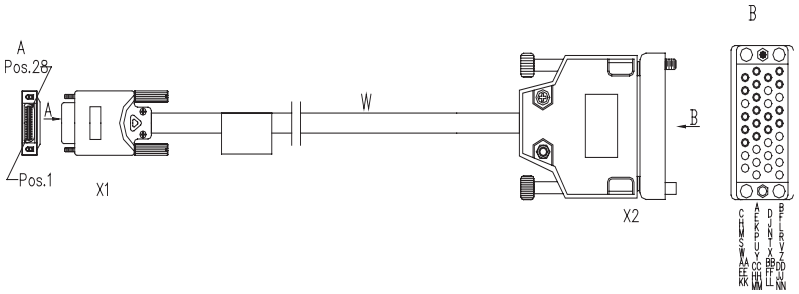
- V.35 DTE cable

Figure 183 V.35 DTE cable



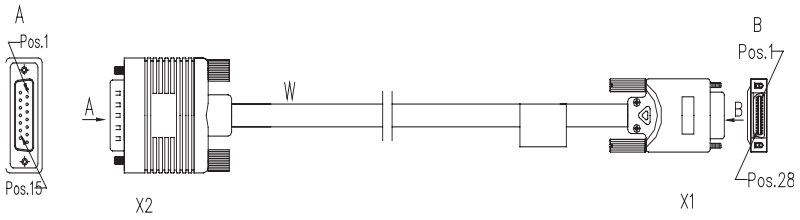
- V.35 DCE cable

Figure 184 V.35 DCE cable



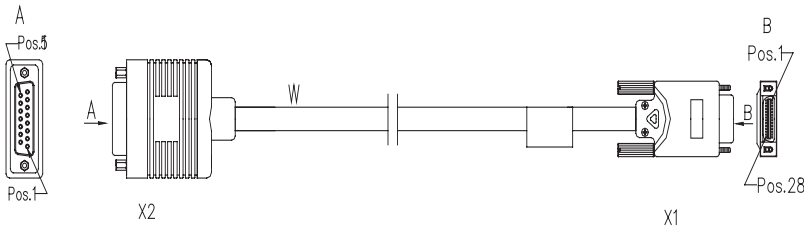
- X.21 DTE cable

Figure 185 X.21 DTE cable



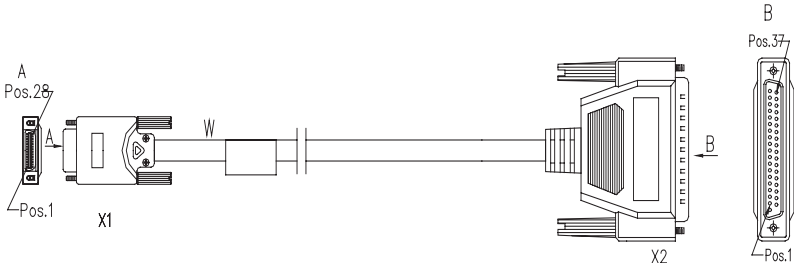
- X.21 DCE cable

Figure 186 X.21 DCE cable



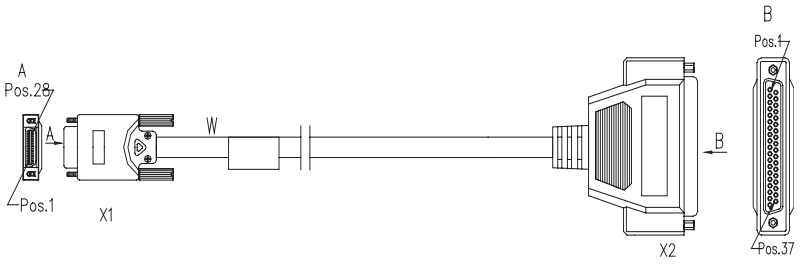
- RS449 DTE cable

Figure 187 RS449 DTE cable



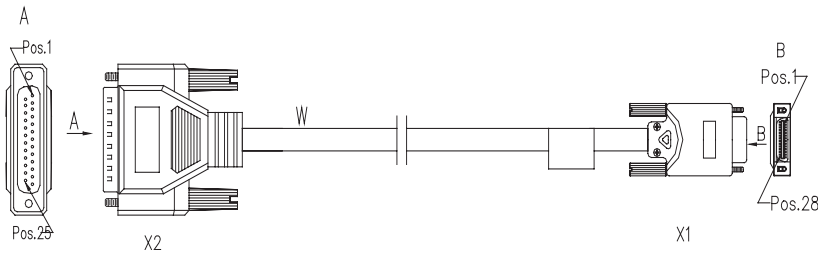
- RS449 DCE cable

Figure 188 RS449 DCE cable



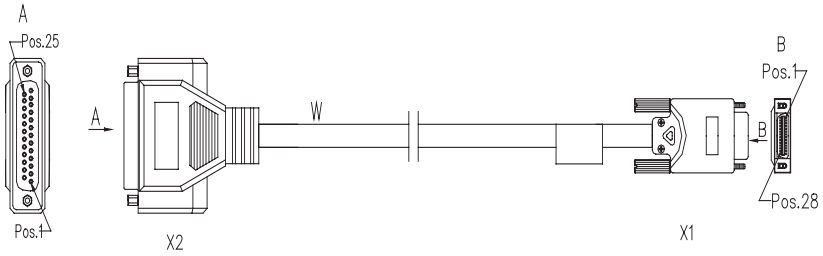
- RS530 DTE cable

Figure 189 RS530 DTE cable



- RS530 DCE cable

Figure 190 RS530 DCE cable



These cables are optional. Please order them together with the FIC-SAE card. By default, they are not provided.

Connecting the Interface Cable

CAUTION: *Do not plug or unplug interface cables into or from the FIC-SAE card to prevent the device or ports from being impaired.*

Before connecting an FIC-SAE card, identify the type of the equipment to be connected (that is, the synchronous/asynchronous mode, DTE/DCE mode, and so on), signaling criterion required by the access equipment, baud rate, and line clock.

Step 1: Identify type of the interface to be connected and then choose the correct synchronous/asynchronous serial interface cable.

Step 2: Plug the DB-28 connector of the cable to the corresponding DB-28 port on the FIC-SAE card.

Step 3: Connect the other end of the cable as follows:

- If the WAN is a DDN line, connect the cable to the port on the CSU/DSU.
- If the WAN is a dialup line, connect the cable to the serial port of an analog modem.

Step 4: Power on the router, and check behavior of the LINK LED on the FIC-SAE panel. It is OFF when fault occurs on the line and signal is not synchronized. Check the line status.

FIC-8ASE/FIC-16ASE

Introduction

Functions

FIC-8ASE/FIC-16ASE, 8-/16-port enhanced asynchronous serial interface card, transmits, receives, and processes data traffic on asynchronous serial interfaces. Each asynchronous serial interface can operate at a speed as fast as 115.2 kbps, supporting terminal access service and asynchronous leased line. In addition, these asynchronous serial interfaces can serve as the dialup access servers for the small

and medium-sized ISPs to interconnect eight (using the FIC-8ASE) or 16 (using the FIC-16ASE) LANs through asynchronous dialup lines.

Interface Attributes

The following table describes the interface attributes of the FIC-8ASE and FIC-16ASE:

Table 111 Interface attributes of the FIC-8ASE/ FIC-16ASE

	Description	
Attribute	**FIC-8ASE**	**FIC-16ASE**
Connector	RJ-45	
Number of connectors	8 (FIC-8ASE) 16 (FIC-16ASE)	
Interface standard and operating mode	RS232	
Cable type	AUX cable Ethernet straight-through cable FIC-8ASE/FIC-16ASE dumb terminal cable	
Min. baud rate (bps)	300	
Max. baud rate (bps)	115.2 k	
Service supported	1) Dialup through modem 2) Backup 3) Terminal access service 4) Asynchronous leased line	

Interface LEDs

The following figures show the FIC-8ASE and FIC-16ASE panels:

Figure 191 FIC-8ASE panel

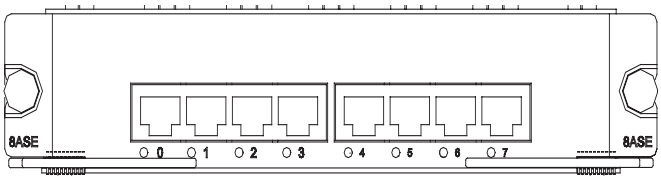
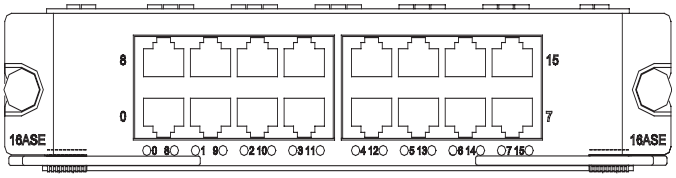


Figure 192 FIC-16ASE panel



The FIC-8ASE/FIC-16ASE has one LED for each port. These LEDs are located in the apertures beneath the ports. ON means a link is present; OFF means data is being transmitted and/or received.

Interface Cable

The FIC-8ASE/FIC-16ASE uses two types of interface cables: AUX cable and dumb terminal cable (RJ-45-to-RJ-45), which can be made on site with network cables.

CAUTION: *AUX cables are optional and are provided only when ordered. As for dumb terminal cables, you can make on site by reference to Low-End-and-Mid-Range Series Routers Cable Manual.*

Connecting the Interface Cable

CAUTION: *Do not plug or unplug interface cables into or from the FIC-8ASE/FIC-16ASE card to prevent the device or ports from being impaired.*

Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.

Step 1: Identify type of the interface to be connected and then select the correct cable.

Step 2: Make connection as follows:

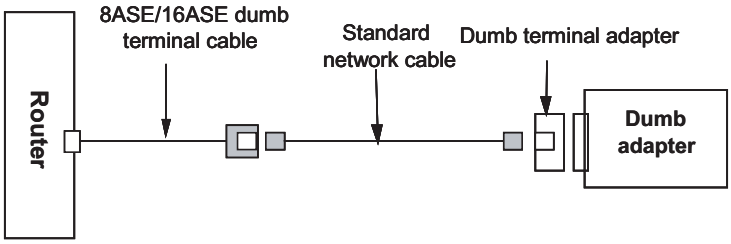
- If an AUX cable is used,

Connect the RJ-45 connector of the cable to the router and the DB-25/DB-9 connector to the network device, usually a modem.

- If a dumb terminal cable is used,

Connect its RJ-45 connector (female) to a straight-through cable and then to a dumb terminal adapter.

Figure 193 Connect the FIC-8ASE/ FIC-16ASE cable to a dumb terminal



Step 3: Power on the router, and check behavior of the LINK LED on the FIC-SAE card: ON means a link is present and OFF means no link is present. Check the line for the cause in the latter case.

FIC-1E1/FIC-2E1/FIC-4E1 and FIC-1E1-F/FIC-2E1-F/FIC-4E1-F

Introduction

FIC-1E1/FIC-2E1/FIC-4E1

FIC-1E1/FIC-2E1/FIC-4E1, the 1-/2-/4-port channelized E1/PRI interface card, transmits, receives, and processes E1 data traffic. In addition, you can use the card for other purposes, such as CE1 access and the ISDN PRI function.

FIC-1E1-F/FIC-2E1-F/FIC-4E1-F

FIC-1E1-F/FIC-2E1-F/FIC-4E1-F, the 1-/2-/4-port fractional E1 interface card, differs from the FIC-1E1/FIC-2E1/FIC-4E1 primarily in the sense that:

- The FE1 operating mode supported by the E1-F cards allows only one n × 64 kbps bundle to be formed on each interface, where n = 1 to 31. However, an E1 card allows arbitrary grouping of 31 channels and multiple bundles.
- The FIC-E1-F cards do not support PRI mode.

Interface Attributes

The following table describes the interface attributes of the FIC-E1 and FIC-E1-F cards.

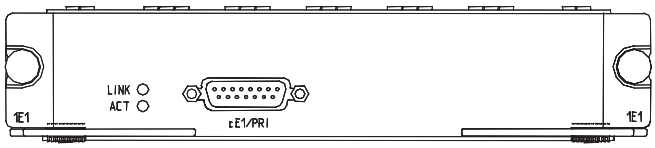
Table 112 Interface attributes of the FIC-E1 and FIC-E1-F cards

	Description		
Attribute	**FIC-1E1/FIC-1E1-F**	**FIC-2E1/FIC-2E1-F**	**FIC-4E1/FIC-4E1-F**
Connector	DB-15	DB-15	DB-25
Number of connectors	1	2	1
Interface standard	G.703, G.704		
Interface rate	2.048 Mbps		
Cable type	E1 75-ohm unbalanced coaxial cable		
	E1 120-ohm balanced twisted-pair cable		
	120-ohm 4E1 adapter cable (FIC-4E1/FIC-4E1-F)		
	75-ohm 4E1 adapter cable (FIC-4E1/FIC-4E1-F)		
	Coaxial connector, network connector, 75-to-120-ohm adapter (with BNC connector)		
Operating mode	E1, CE1, ISDN PRI (only supported by the FIC-E1 cards)		
	FE1 (only supported by the FIC-E1-F cards)		
Supported service	Backup		
	Leased line		
	ISDN PRI (only supported by the FIC-E1 cards)		

Interface LEDs

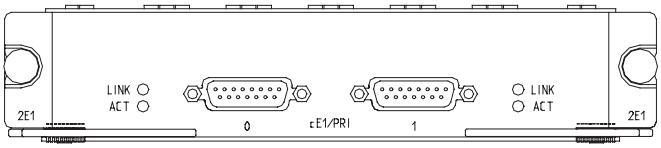
The following figure illustrates the FIC-1E1 panel.

Figure 194 FIC-1E1 panel



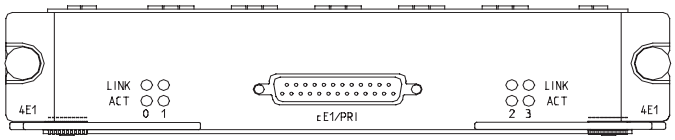
The following figure illustrates the FIC-2E1 panel.

Figure 195 FIC-2E1 panel



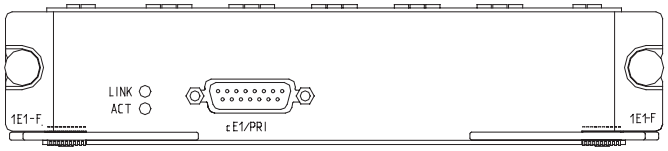
The following figure illustrates the FIC-4E1 panel.

Figure 196 FIC-4E1 panel



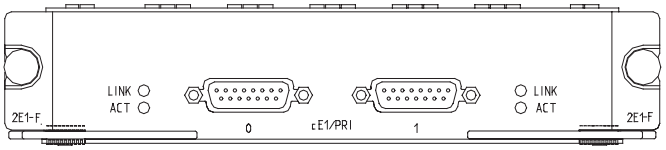
The following figure illustrates the FIC-1E1-F panel.

Figure 197 FIC-1E1-F panel



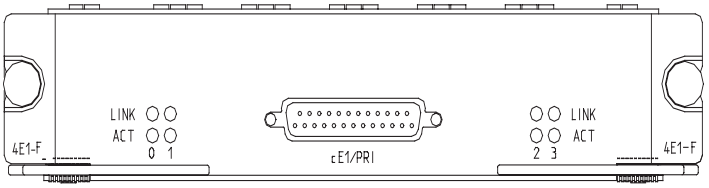
The following figure illustrates the FIC-2E1-F panel.

Figure 198 FIC-2E1-F panel



The following figure illustrates the FIC-4E1-F panel.

Figure 199 FIC-4E1-F panel



The following table describes the LEDs on the card panels.

Table 113 LEDs on the FIC-E1 and FIC-E1-F panels

LED	Description
LINK	ON means the carrier signal has been received.
	OFF means no carrier signal has been received.
ACTIVE	OFF means no data is being transmitted or received on the interface.
	Blinking means data is being transmitted and/or received.

Interface Cable

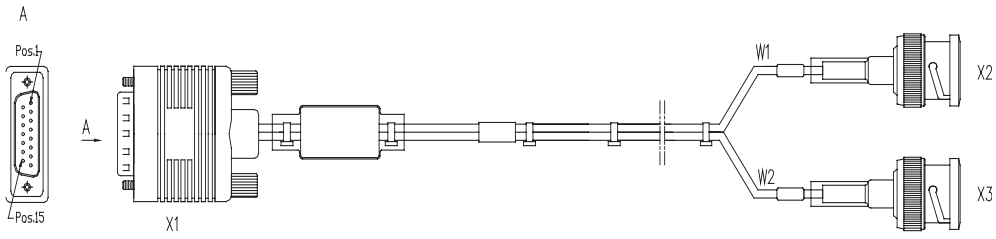
Interface cable of the FIC-1E1/FIC-2E1 and the FIC-1E1-F/FIC-2E1-F

Interface cables for the FIC-1E1/FIC-2E1 and FIC-1E1-F/FIC-2E1-F are G.703-compliant cables, also known as E1 cables. The cables are divided into two categories: 75-ohm unbalanced coaxial and 120-ohm balanced twisted-pair.

- 75-ohm unbalanced coaxial cable

As shown in the following figure, at the router end of the cable is a DB-15 plug and at the network end are two BNC receptacles.

Figure 200 E1 75-ohm unbalanced coaxial cable

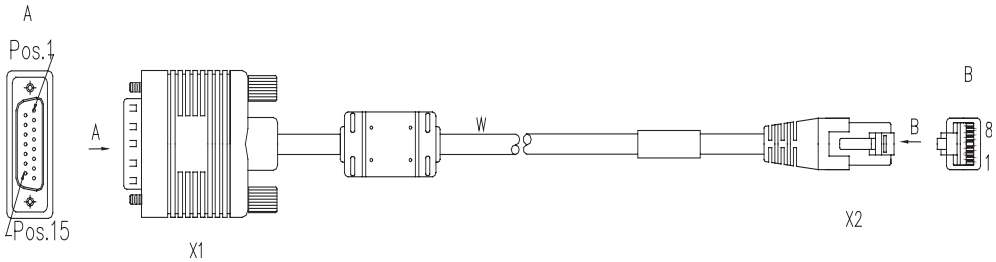


To extend an E1 75-ohm unbalanced coaxial cable, you can select a pair of coaxial connectors with a BNC receptacle at each end to connect the BNC receptacles of the cable each to a 75-ohm unbalanced coaxial cable with BNC connectors.

- 120-ohm balanced twisted-pair cable

As shown in the following figure, at the router end of the cable is a DB-15 plug and at the network end is an RJ-45 connector.

Figure 201 E1 120-ohm balanced twisted-pair cable



To extend an E1 120-ohm balanced twisted-pair cable, you can select a network connector with an RJ-45 receptacle at each end to connect the cable to another 120-ohm balanced twisted-pair cable.

In addition, you are available with 75-ohm-to-120-ohm adapters.

E1 cable, coaxial connector, network connector, and 75-ohm-to-120-ohm adapter are all optional accessories. Please order them together with E1/FIC-2E1 and FIC-1E1-F/FIC-2E1-F. By default, they are not provided.

Interface cable of the FIC-4E1/FIC-4E1-F

FIC-4E1/FIC-4E1-F provides two types of 1-to-4 adapter cables: 120-ohm 4E1 and 75-ohm 4E1. At one end of both cables is a DB-25 connector for connecting the router, and at the other end are four DB-15 connectors for connecting E1 cables. You can distinguish between them by the main label text: "4E1-120ohm-CAB" for the 120-ohm 4E1 adapter cable and "4E1-75ohm-CAB" for the 75-ohm 4E1 adapter cable.

As shown in the following two figures, both cables look similar except that the 75-ohm 4E1 adapter cable uses eight coaxial cables but the 120-ohm 4E1 adapter cable uses four twisted-pair cables.

Figure 202 120-ohm 4E1 adapter cable

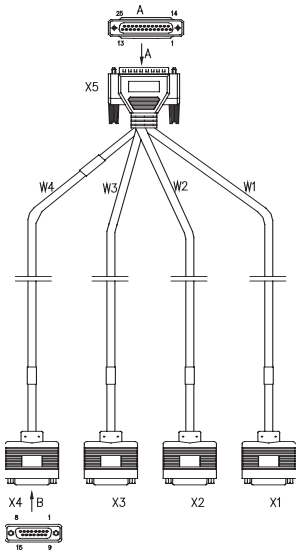
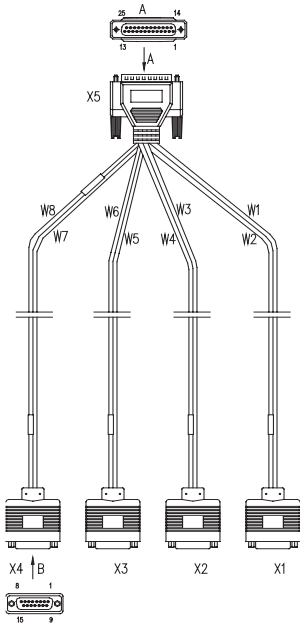


Figure 203 75-ohm 4E1 adapter cable



Both 75-ohm 4E1 and 120-ohm 4E1 adapter cables are required for FIC-4E1/FIC-4E1-F. But E1 cables are optional, and please order together with FIC-4E1/FIC-4E1-F; by default, they are not provided.

In addition, you are available with 75-ohm-to-120-ohm adapters.

Internal DIP Switch

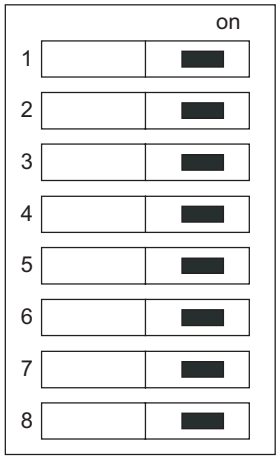
The FIC-E1 and the FIC-E1-F cards provide internal DIP switches, the setting of which decides interface impedance and the grounding mode.

Table 114 DIP switches and E1 interfaces of the FIC-E1/FIC-E1-F cards

Card	FIC-1E1/FIC-1E1-F	FIC-2E1/FIC-2E1-F		FIC-4E1/FIC-4E1-F			
DIP switch	S1	S1	S2	S1	S2	S3	S4
Controlled E1 interface	Interface 0	Interface 0	Interface 1	Interface 0	Interface 1	Interface 2	Interface 3

By default, all the DIP switch BITs are placed to the position of ON, as illustrated in the following figure:

Figure 204 Default setting of the DIP switches for the FIC-E1/FIC-E1-F cards



The following table describes how to set a DIP switch on the FIC-E1/FIC-E1-F cards:

Table 115 Setting DIP switches on the FIC-E1/FIC-E1-F cards

DIP switch	Description	Configuration of 75-ohm impedance	Configuration of 120-ohm impedance
1BIT	75-ohm/120-ohm toggle switch	ON	OFF
2BIT		ON	OFF
3BIT		ON	OFF
4BIT		ON	OFF
5BIT		ON	OFF
6BIT	RxRing grounding mode switch	OFF: RxRing is grounded using capacitance. ON: RxRing is grounded directly.	-
7BIT	RxShield grounding switch	-	ON: RxShield is grounded. OFF: RxShield is not grounded.
8BIT	RxShield grounding mode switch	-	OFF: RxShield is grounded using capacitance ON: RxShield is grounded directly.

CAUTION: *When connecting an FIC-E1/FIC-E1-F card to an external 75-ohm cable, you are recommended to place BITs 1 through 8 to the ON position; when connecting the card to an external 120-ohm cable, place BITs 1 through 8 to the OFF position. Only trained personnel are allowed to change the settings of the DIP switches.*

By default, all the DIP switch BITs are in the ON position (factory default), which means the impedance of E1 ports is 75-ohm.

Connecting the Interface Cable

CAUTION: *Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.*

If outdoor cabling is involved, consider to install a special lightning arrester at the input end of the interface cable for better lightning protection.

Connecting the interface cable of the FIC-1E1/FIC-2E1/FIC-1E1-F/FIC-2E1-F

Step 1: Identify type of the E1 cable, and set the DIP switch for the to-be-connected E1/FE1 port correctly.

Step 2: Plug the DB-15 connector of the E1 cable into the E1/FE1 port on the card.

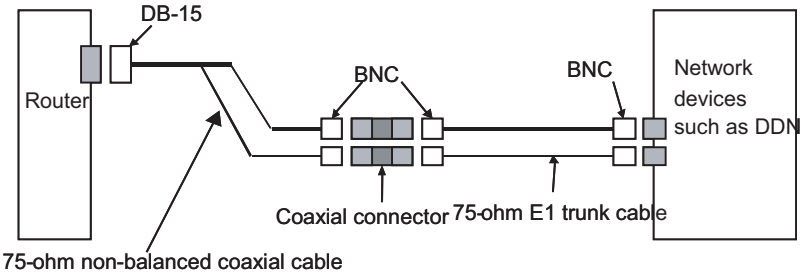
Step 3: Connect the other end of the E1 cable to another device.

When using a 75-ohm unbalanced coaxial cable, do the following:

- If no cable extension is needed, directly connect the BNC connector of the cable to the device.
- If cable extension is needed, connect the BNC connector of the cable to a coaxial connector, and then connect the other end of the coaxial connector to the device using a 75-ohm E1 trunk cable.

CAUTION: *When connecting the router to another device using an E1 coaxial cable, make connection with the TX end to the RX end and the RX end to the TX end.*

Figure 205 Extending an E1 75-ohm unbalanced coaxial cable

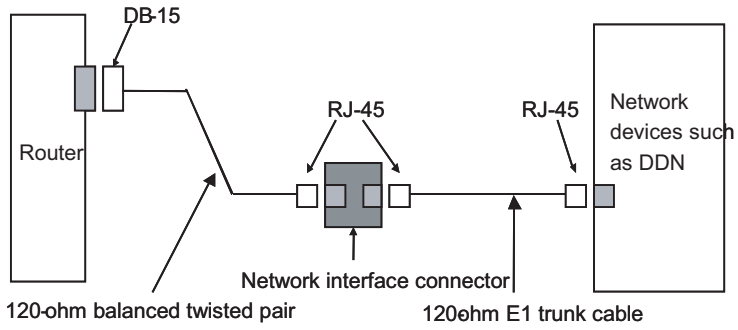


- If the to-be-connected network device has a 120-ohm port, you need a 75-ohm-to-120-ohm adapter or a 120-ohm cable instead.

When using a 120-ohm balanced twisted-pair cable, do the following:

- If no cable extension is needed, directly connect the RJ-45 connector of the cable to the RJ-45 port on the device.
- If cable extension is needed, connect the RJ-45 connector of the cable to a network interface connector, and the other end of the network interface connector to the device using a 120-ohm E1 trunk cable.

Figure 206 Extending an E1 120-ohm balanced twisted-pair cable



Step 4: Power on the router, and check the behavior of the LINK LED on the card: OFF means fault occurs on the line and the signal is not synchronized. Check the line status.

Connecting the interface cable of the FIC-4E1/FIC-4E1-F

Step 1: Select the 4E1/E1 cable appropriate to the type of the port on the to-be-connected device, and correctly set the DIP switch.

- If the impedance of the to-be-connected port is 75-ohm, select E1 75-ohm unbalanced coaxial and 75-ohm 4E1 adapter cables, and set all the BITs of the DIP switch to the ON position (that is, the port impedance is 75-ohm).
- If the impedance of the to-be-connected port is 120-ohm, select E1 120-ohm balanced twisted-pair and 120-ohm 4E1 adapter cables, and set all the BITs of the DIP switch to the OFF position (that is, the port impedance is 120-ohm).

Step 2: Insert the DB-25 connector of the 4E1 adapter cable into the to-be-connected port on the FIC-4E1/FIC-4E1-F and tighten the thumbscrews.

Step 3: Identify the sequence number of the DB-15 connector at the other end of the cable, and connect the connector to an E1 cable.

Step 4: Connect the E1 cable to another device, by reference to the previous subsection.

Step 5: Power on the router, and check the behavior of the LINK LED on the card panel: OFF means fault occurs on the line and the signal is not synchronized. Check the line status.

FIC-8E1/FIC-8E1-F

Introduction

FIC-8E1

FIC-8E1, the 8-port channelized E1/PRI interface card, transmits, receives, and processes eight channels of E1 data traffic. In addition, you can use the card for other purposes, such as CE1 access and the ISDN PRI function.

FIC-8E1-F

FIC-8E1-F, the 8-port fractional E1 interface card, is different from the FIC-8E1 interface card in the sense that:

- The FE1 operating mode supported by the FIC-8E1-F card allows only one n × 64 kbps bundle to be formed on each interface, where n = 1 to 31. However, a FIC-8E1 card allows arbitrary grouping of 31 channels and therefore multiple bundles.
- The FIC-8E1-F card does not support PRI mode.

Given a FIC-8E1 card, the system automatically creates a serial interface for each timeslot bundle formed on a controller E1 interface.

Interface Attributes

The following table describes the interface attributes of the FIC-8E1/FIC-8E1-F cards.

Table 116 Interface attributes of the FIC-8E1/FIC-8E1-F card

	Description	
Attribute	**FIC-8E1/FIC-8E1-F (75-ohm)**	**FIC-8E1/FIC-8E1-F (120-ohm)**
Connector	DB-68	
Number of connectors	1	
Interface standard	G.703	
Interface rate	2.048 Mbps	
Cable type	75-ohm 8E1 conversion cable	120-ohm 8E1 conversion cable
Operating mode	E1, CE1, ISDN PRI (only supported by the FIC-8E1) FE1 (only supported by the FIC-8E1-F)	
Supported service	1) Backup 2) Terminal access service 3) ISDN PRI (only supported by the FIC-8E1)	

Interface LEDs

FIC-8E1 and FIC-8E1-F panels are similar. The following figures illustrate the FIC-8E1 panels.

Figure 207 FIC-8E1 (120-ohm) panel

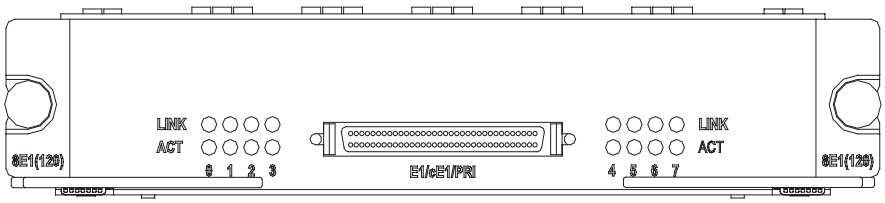
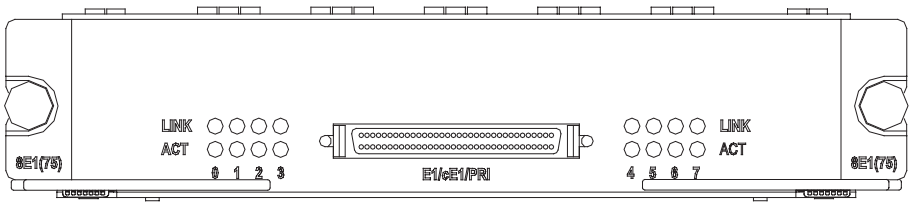


Figure 208 FIC-8E1 (75-ohm) panel



The following table describes the LEDs on the card panels:

Table 117 LEDs on the FIC-8E1/FIC-8E1-F panels

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received. ON means data is being transmitted and/or received.

Interface Cable

The FIC-8E1/FIC-8E1-F card provides eight E1 ports and adopts a 120-ohm or a 75-ohm 8E1 conversion cable. The two types of cables look similar. Both of them have a DB-68 connector at one end for connecting the router. At the other end, however, the 75-ohm 8E1 conversion cable provides 16 coaxial cable connectors; and the 120-ohm 8E1 conversion cable provides eight twisted pair cable connectors, as shown in the following figures:

Figure 209 75-ohm 8E1 conversion cable

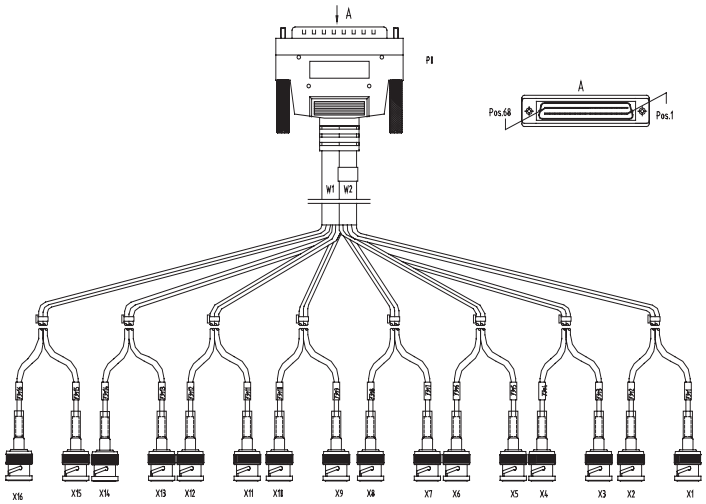
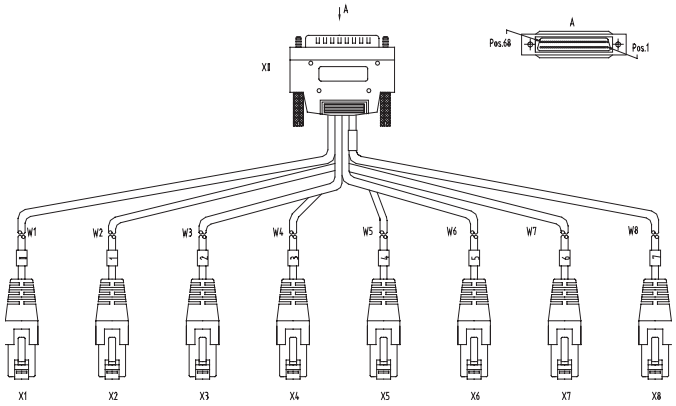


Figure 210 120-ohm 8E1 conversion cable



Connecting the Interface Cable

CAUTION: *Before you connect a port, read its label carefully; a wrong connection may impair the interface card and even damage the device.*

You are recommended to install a special lightning arrester at the input end of the interface cable for better lightning protection.

Step 1: Choose an 8E1 conversion cable appropriate to the interface type of the device to be connected.

- If the interface impedance of the device is 75-ohm, use a 75-ohm 8E1 conversion cable.
- If the interface impedance of the device is 120-ohm, use a 120-ohm 8E1 conversion cable.

Step 2: Insert the DB-68 connector of the cable to the DB-68 port on the FIC-8E1/FIC-8E1-F card, and fasten the cable fastening screws.

Step 3: Identify the sequence number of the other end of the 8E1/4E1 conversion cable and connect it with a peer device.

Step 4: Power on the router. Check the behavior of the LINK LED on the card panel: OFF means fault has occurred on the line and signal is out of synchronization. Check the line status.

FIC-1T1/FIC-2T1/FIC-4T1 and FIC-1T1-F/FIC-2T1-F/FIC-4T1-F

Introduction

FIC-1T1/FIC-2T1/FIC-4T1

FIC-1T1/FIC-2T1/FIC-4T1, the 1-/2-/4-port channelized T1/PRI interface card, transmits, receives, and processes T1 data traffic. In addition, you can use the card for other purposes, such as CT1 access and the ISDN PRI function.

FIC-1T1-F/FIC-2T1-F/FIC-4T1-F

FIC-1T1-F/FIC-2T1-F/FIC-4T1-F, the 1-/2-4-port fractional T1 interface card, differs from the FIC-1T1/FIC-2T1/FIC-4T1 primarily in the sense that:

- The FT1 operating mode supported by the T1-F cards allows only one n × 64 kbps or n × 56 kbps bundle to be formed on each interface, where n = 1 to 24. However, a T1 card allows arbitrary grouping of 24 channels and multiple bundles.
- The FIC-T1-F cards do not support PRI mode.

Interface Attributes

The following table describes the interface attributes of the FIC-T1/FIC-T1-F cards.

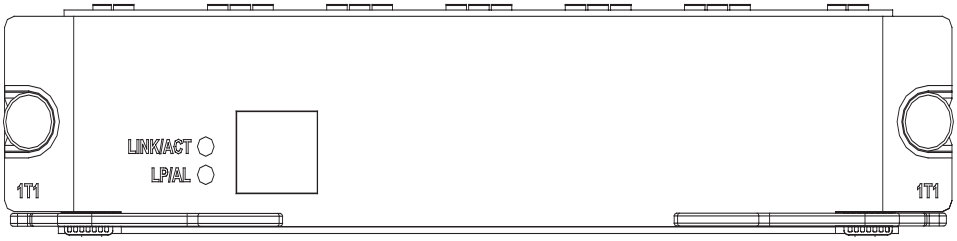
Table 118 Interface attributes of the FIC-T1/FIC-T1-F cards

Attribute	Description
Connector	RJ-45
Number of connectors	1 (FIC-1T1/FIC-1T1-F)
	2 (FIC-2T1/FIC-2T1-F)
	4 (FIC-4T1/FIC-4T1-F)
Interface standard	G.703/T1 102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm straight-through shielded cable)
Operating mode	CT1, ISDN PRI (only supported by the FIC-T1 cards)
	FT1 (only supported by the FIC-T1-F cards)
Supported service	Backup
	Leased line
	ISDN PRI (only supported by the FIC-1T1/FIC-2T1/FIC-4T1 card)

Interface LEDs

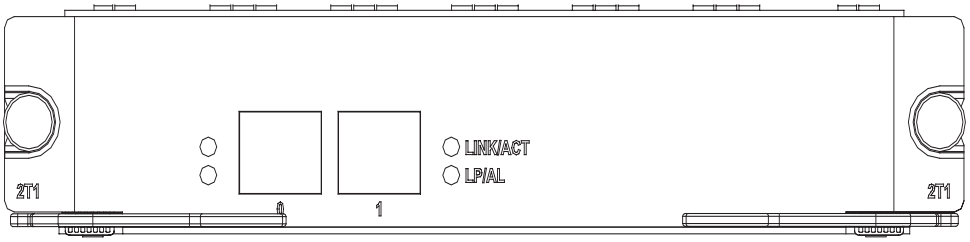
The following figure illustrates the FIC-1T1 panel.

Figure 211 FIC-1T1 panel



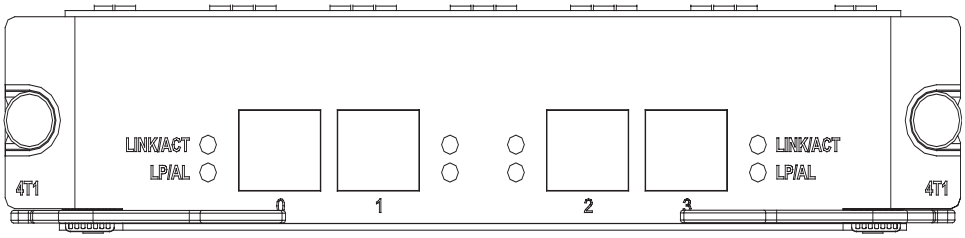
The following figure illustrates the FIC-2T1 panel.

Figure 212 FIC-2T1 panel



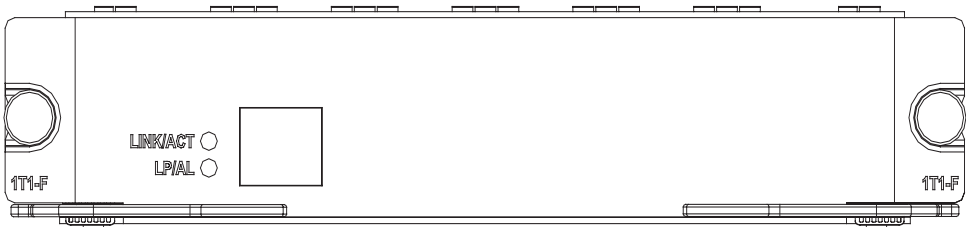
The following figure illustrates the FIC-4T1 panel.

Figure 213 FIC-4T1 panel



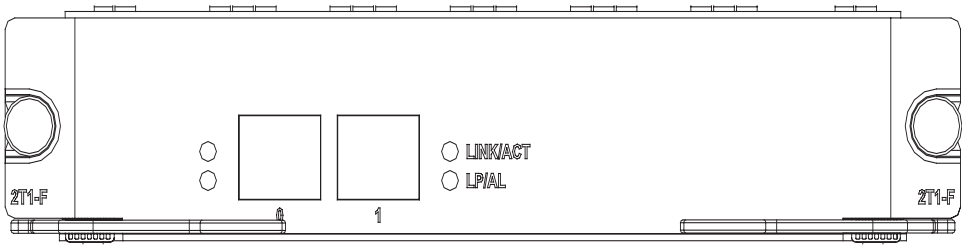
The following figure illustrates the FIC-1T1-F panel.

Figure 214 FIC-1T1-F panel



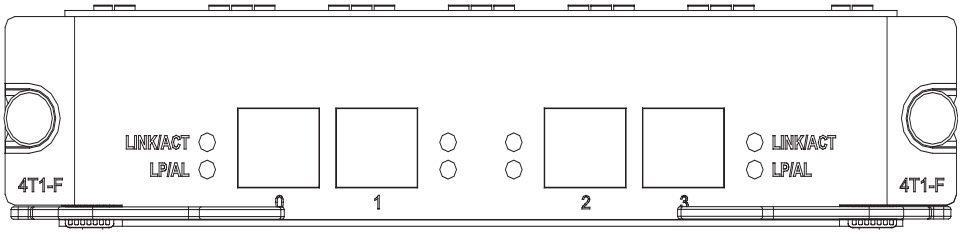
The following figure illustrates the FIC-2T1-F panel.

Figure 215 FIC-2T1-F panel



The following figure illustrates the FIC-4T1-F panel.

Figure 216 FIC-4T1-F panel



The following table describes the LEDs on the card panels.

Table 119 LEDs on the FIC-T1 and FIC-T1-F panels

LED	Description
LINK/ACT	ON means the carrier signal has been received. OFF means no carrier signal has been received. Blinking means data is being transmitted or/and received.
LP/AL	ON means the interface is in a loopback. Blinking means an AIS, LFA, or RAI alarm signal is present. OFF means no loopback or alarm is present.

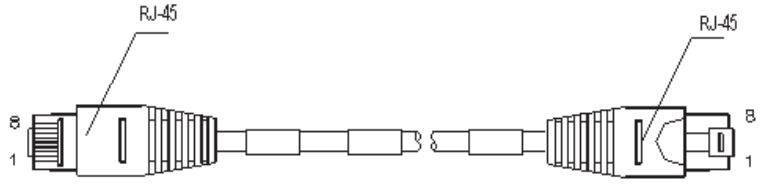
Note:

AIS = Alarm indication signal; LFA = loss of frame alignment; RAI = Remote alarm indication

Interface Cable

Interface cables (T1 cables) for the FIC-T1/FIC-T1-F cards are 100-ohm straight-through shielded cables, as shown in the following figure:

Figure 217 T1 cable



To extend a T1 cable, you may connect the cable to another one using a network interface connector with an RJ-45 receptacle at each end.

Both T1 cable and network interface connector are optional accessories. Please order them together with FIC-1T1/FIC-2T1/FIC-4T1 and FIC-1T1-F/FIC-2T1-F/FIC-4T1-F. By default, they are not provided.

Connecting the Interface Cable

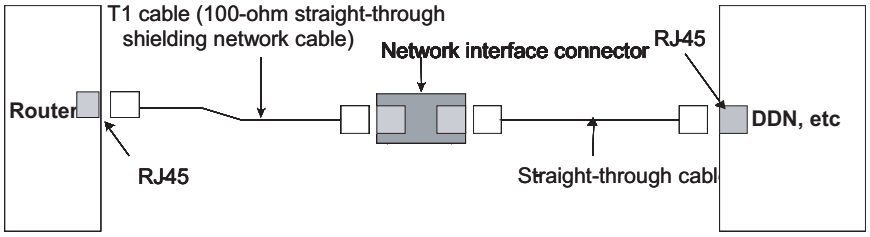
CAUTION: *Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.*

If outdoor cabling is involved, consider to install a special lightning arrester at the input end of the T1 interface cable for better lightning protection.

Step 1: Insert one end of the T1 cable into the to-be-connected RJ-45 connector on the card.

Step 2: Connect the other end of the cable to another device directly if the cable is long enough. If not, extend the cable before you do that, as shown in the following figure:

Figure 218 Extending a T1 cable



Step 3: Power on the router, and check the behavior of the LINK LED on the card panel: OFF means fault occurs on the line. Check the line status.

FIC-8T1/FIC-8T1-F

Introduction

FIC-8T1

FIC-8T1, the 8-port channelized T1/PRI interface card, transmits, receives, and processes eight channels of T1 data traffic. In addition, you can use the card for other purposes, such as CT1 access and the ISDN PRI function.

FIC-8T1-F

FIC-8T1-F, the 8-port fractional T1 interface card, is different from the FIC-8T1 card in the sense that:

- The FT1 operating mode supported by the FIC-8T1-F card allows only one n × 64 kbps or n × 56 kbps bundle to be formed on each interface, where n = 1 to 24. However, the FIC-8T1 card allows arbitrary grouping of 24 channels and therefore multiple bundles.
- The FIC-8T1-F card does not support PRI mode.

Given a FIC-8T1 card, the system automatically creates a serial interface for each timeslot bundle formed on a controller T1 interface.

Interface Attributes

The following table describes the interface attributes of the FIC-8T1/FIC-8T1-F card.

Table 120 LEDs on the FIC-8T1 and FIC-8T1-F panels

Attribute	Description
Connector	RJ-45
Number of connectors	1
Interface standard	G.703/T1 102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	8T1 conversion cable (100-ohm straight-through shielded network cable)

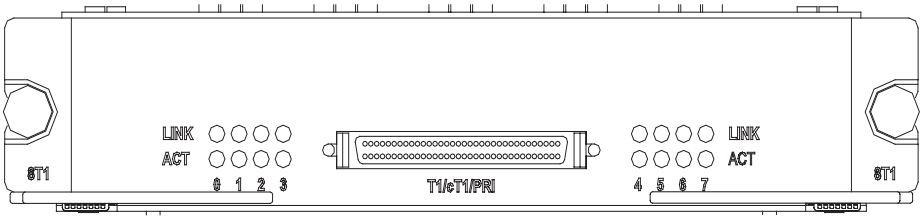
Table 120 LEDs on the FIC-8T1 and FIC-8T1-F panels

Attribute	Description
Operating mode	CT1, ISDN PRI (only supported by the FIC-8T1)
	FT1 (only supported by the FIC-8T1-F)
Supported service	1) Backup
	2) Terminal access service
	3) ISDN PRI (supported by the FIC-8T1)

Interface LEDs

FIC-8T1 and FIC-8T1-F panels look the same. The following figure illustrates a FIC-8T1 panel.

Figure 219 FIC-8T1 panel



The following table describes the LEDs on the card panels:

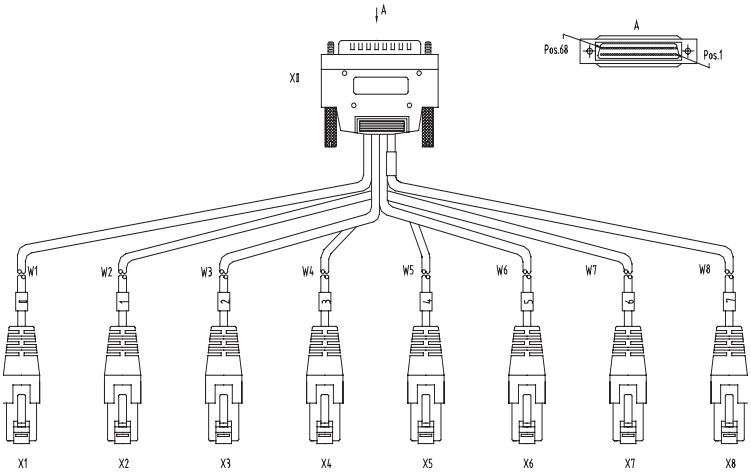
Table 121 LEDs on FIC-8T1 and FIC-8T1-F panels

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received. ON means data is being transmitted and/or received.

Interface Cable

The following figure illustrates the 8T1 conversion cable for the FIC-8T1/FIC-8T1-F card.

Figure 220 8T1 conversion cable



At one end of the cable is a DB-68 connector for connecting the router and at the other end are eight RJ-45 connectors for connecting other devices.

Connecting the Interface Cable

CAUTION: *Before you connect a port, read its label carefully; a wrong connection can impair the interface card and even damage the device.*

If the interface cable is routed outdoors, you are recommended to install a special lightning arrester at the input end of the interface cable for better lightning protection.

Step 1: Insert the DB-68 connector of the 8T1 conversion cable to the DB-68 port on the FIC-8T1/FIC-8T1-F card.

Step 2: Connect one RJ-45 connector at the other end of the cable to the device to be connected.

Step 3: Power on the router. Check the behavior of the LINK LED on the card panel: OFF means fault occurs on the line. Check the line status.

FIC-1CE3

Introduction

FIC-1CE3, the 1-port channelized E3 interface card, delivers these functions:

- In E3 mode, transmitting, receiving, and processing one channel of E3 fast traffic; providing E3 traffic access.
- In CE3 mode, providing the subscribers with N × 64 kbps low-speed access, where N is smaller than or equal to 128.

- *E3 represents the tertiary group rate of E system in the TDM system, that is, 34.368 Mbps. Through E23 and E12 demultiplexing, an E3 channel can be channelized into 16 E1 lines, each supporting both the E1 and CE1 modes. E23 means either E2-to-E3 multiplex or E3-to-E2 demultiplex, and E12 means E1-to-E2 multiplex or E2-to-E1 demultiplex. "E23" and "E12" discussed here represent the demultiplex process.*

Interface Attributes

The following table describes the interface attributes of the FIC-1CE3/FIC-2CE3.

Table 122 FIC-1CE3 interface attributes

Attribute	Description
Connector	SMB
Number of connectors	2
Interface standard	G.703
	G.704
	G.751
Interface rate	34.368 Mbps
Cable type	E3 cable (75-ohm coaxial cable)

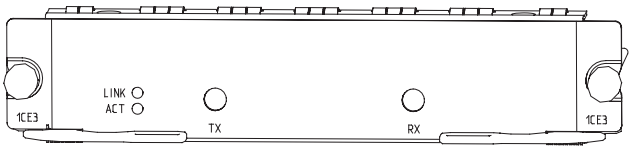
Table 122 FIC-1CE3 interface attributes

Attribute	Description
Operating mode	E3
	CE3
Supported service	E3 leased line

Interface LEDs

The following figure illustrates an FIC-1CE3 panel.

Figure 221 FIC-1CE3 panel



The following table describes the LEDs on the card panel.

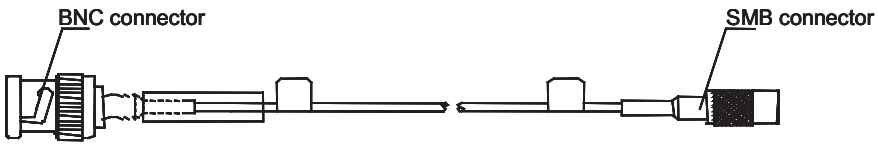
Table 123 LEDs on the FIC-1CE3 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received on the interface; blinking means data is being transmitted and/or received.

Interface Cable

The external interface provided by the FIC-1CE3 uses two SMB sockets respectively for data transmitting (Tx) and data receiving (Rx). The interface transmits in 75-ohm unbalanced mode and uses a pair of 75-ohm unbalanced coaxial cables to connect another device.

Figure 222 E3/T3 cable



The FIC-1CE3 and the FIC-1CT3 use the same cable, called E3/T3 cable in this manual.

The standard equipping package of the FIC-1CE3 does not include the interface cable.

Connecting the Interface Cable

CAUTION: *By design, the FIC-1CE3 is protected against lightning strikes. But when outdoor cabling is involved, you are recommended to add a special lightning arrester at the input end of the E3/T3 cable for better protection.*

Step 1: Connect the SMB connector of an E3/T3 cable to the Tx port on the FIC-1CE3 and the other end to the Rx port on another device.

Step 2: Connect the SMB connector of another E3/T3 cable to the Rx port on the FIC-1CE3 and the other end to the Tx port on another device.

Step 3: Power on the router, and check the behavior of the LINK LED on the FIC-1CE3 panel: OFF means fault occurs on the line and the signal is not synchronized. Check the line status.

FIC-1CT3

Introduction

FIC-1CT3, the 1-port channelized T3 interface card, delivers these functions:

- In T3 mode, transmitting, receiving, and processing one channel of T3 fast traffic; providing T3 traffic access.
- In CT3 mode, providing the subscribers with N × 64 kbps or N × 56 kbps low-speed access, where N is smaller than or equal to 128.

T3 represents the tertiary group rate of T system in the TDM system, that is, 44.736 Mbps. Through T23 and T12A demultiplexing, a T3 channel can be channelized into 28 T1 lines, each also supporting the operating mode of CT1. T23 means either T2-to-T3 multiplex or T3-to-T2 demultiplex, and T12 means T1-to-T2 multiplex or T2-to-T1 demultiplex. "T23" and "T12" discussed here represent the demultiplex process.

Interface Attributes

The following table describes the interface attributes of the FIC-1CT3.

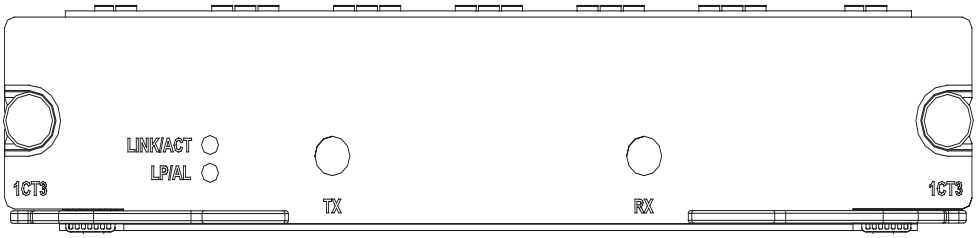
Table 124 FIC-1CT3 interface attributes

Attribute	Description
Connector	SMB
Number of connectors	2
Interface standard	G.703
	G.704
	G.752
	AT&T TR 54014
	AT&T TR 62415
	ANSI T1.107
Interface rate	44.736 Mbps
Cable	T3 cable (75-ohm coaxial cable)
Operating mode	T3
	CT3
Supported service	T3 leased line

Interface LEDs

The following figure illustrates an FIC-1CT3 panel.

Figure 223 FIC-1CT3 panel



The following table describes the LEDs on the card panel.

Table 125 LEDs on the FIC-1CT3 panel

LED	Description
LINK/ACT	ON means the carrier signal has been received. OFF means no carrier signal has been received. Blinking means data is being transmitted or/and received.
LP/AL	ON means the interface is in a loopback. Blinking means an AIS, LFA, or RAI alarm signal is present. OFF means no loopback or alarm is present.

Note:

AIS = Alarm indication signal; LFA = loss of frame alignment; RAI = Remote alarm indication

Interface Cable

Refer to "FIC-1CE3" on page 178.

The interface cable for the FIC-1CT3 is the same as that for the FIC-1CE3 and is connected in the same way.

FIC-4BSE

Introduction

FIC-4BSE, the four-port ISDN BRI interface card, transmits, receives, and processes four channels of ISDN BRI S/T data traffic on ISDN BRI S/T interfaces.

The FIC-4BSE differs from the FIC-4BS only in the way they set matched resistance for an ISDN BRI S/T interface: the FIC-4BS uses jumpers while the FIC-4BSE uses DIP switches.

The FIC-4BSE can work in dial mode or leased line mode.

Interface Attributes

The following table describes the interface attributes of the FIC-4BSE.

Table 126 Interface attributes of the FIC-4BSE

Attribute	Description
Connector	RJ-45
Number of connectors	4

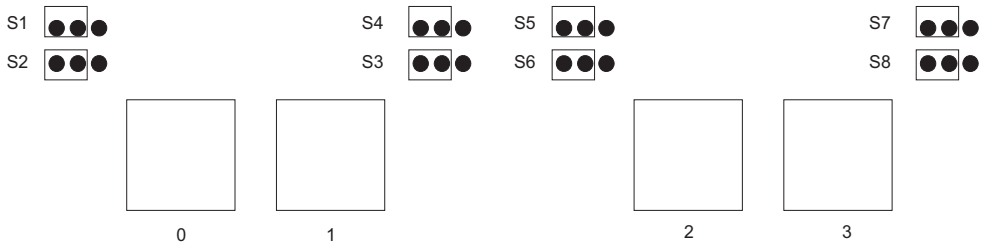
Table 126 Interface attributes of the FIC-4BSE

Attribute	Description
Cable	ISDN S/T cable
Protocol & standard	ITU-T I.430, Q.921, Q.931
Operating mode	ISDN dial-up
	ISDN leased line
Supported service	ISDN
	ISDN supplementary services
	Multi-user number
	Sub-addressing
	Backup

Jumper Settings

The FIC-4BSE uses jumpers to set matched resistance for ISDN BRI S/T interfaces. The use of 100-ohm resistance on an ISDN BRI S/T interface depends on jumper settings. The following figure shows the jumper settings, where all the ISDN BRI S/T interfaces are using 100-ohm resistance.

Figure 224 Jumper settings of the FIC-4BSE (example)



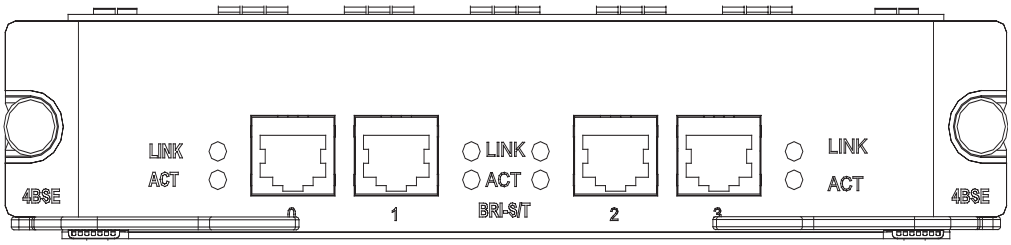
The following table describes how to set jumpers.

Table 127 Set the jumpers on the FIC-4BSE

Jumper settings & description			Default
Interface 0	S2	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	The jumpers are placed over jump pins 2 and 3, meaning 100-ohm matched resistances are not used.
	S1	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	
Interface 1	S4	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	
	S3	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	
Interface 2	S6	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	
	S5	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	
Interface 3	S8	To use a 100-ohm matched resistance for data transmission, place the jumper over pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	
	S7	To use a 100-ohm matched resistance for data receiving, place the jumper over jump pins 1 and 2. To do otherwise, place the jumper over jump pins 2 and 3. See Figure 224.	

Interface LEDs The following figure illustrates the FIC-4BSE panel.

Figure 225 FIC-4BSE panel



The following table describes the LEDs on the card panel.

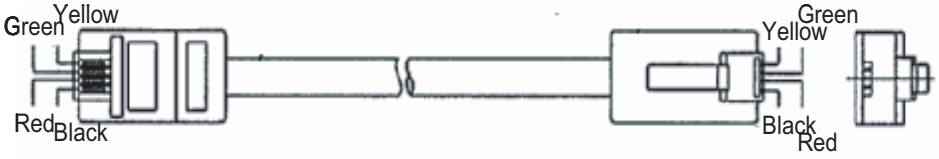
Table 128 LEDs on the FIC-4BSE panel

LED	Description
LINK	OFF means no link is present.
	ON means a link is present.
ACT	OFF means no data is being received or transmitted.
	Blinking means data is being received and/or transmitted.

Interface Cable

The FIC-4BSE uses straight-through ISDN S/T cables, with pins 3 and 6 for data transmission, and pins 4 and 5 for data receiving. At both ends of ISDN S/T cable are RJ-45 connectors.

Figure 226 Straight-through ISDN S/T cable



The standard equipping package for the FIC-4BSE includes the appropriate interface cables.

Connecting the Interface Cable

CAUTION: *If outdoor cabling is involved, consider to install a special lightning arrester at the input end of the interface cable for better lightning protection.*

Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.

Step 1: Identify the to-be-connected port on the FIC-4BSE.

Step 2: Identify the type of the ISDN line provided by your telecommunications service provider.

Step 3: Connect the cable.

- For an ISDN U interface line, adapt the interface with an NT1 by inserting one end of the S/T interface cable into the S/T port on the NT1 and the other end to the BRI port on the FIC-4BSE.
- For an ISDN S/T interface line, directly connect the cable to the BRI port on the FIC-4BSE.

FIC-1AE3

Introduction

FIC-1AE3, the 1-port 34 Mbps ATM-E3 interface card, provides these functions:

- Two ATM cell mapping modes: ATM direct mapping (ADM) and physical layer convergence protocol (PLCP).
- Scrambling in data transmission.
- Line clock (when working as DTE interface) and internal clock (when working as DCE interface).
- Four types of test measures: local cell loopback, local loopback, remote payload loopback, and remote line loopback.

You may equip your router with FIC-1AE3 cards to its full capacity. Yet, you are recommended to install only one FIC-1AE3 on it, whatever its model is, to ensure performance of some key services.

Interface Attributes

The following table describes the interface attributes of the FIC-1AE3.

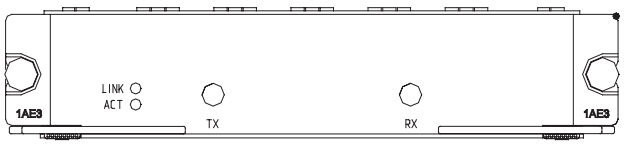
Table 129 Interface attributes of the FIC-1AE3

Attribute	FIC-1AE3
Connector	SMB
Number of connectors	2
Interface standard	G.703, G.751, G.832, G.823
Interface rate	34.368 Mbps
Interface cable	E3/T3 cable (75-ohm coaxial cables)
Supported services	ATM traffic CBR (constant bit rate), rt_VBR (variable bit rate-real time), nrt_VBR (variable bit rate-non real time), UBR (unspecified bit rate)

Interface LEDs

The following figure illustrates the FIC-1AE3 panel:

Figure 227 FIC-1AE3 panel



The following table describes the LEDs on the FIC-1AE3 panel.

Table 130 LEDs on the FIC-1AE3 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The interface that the FIC-1AE3 provides uses two SMB sockets for data transmitting and receiving respectively. The ports adopt the 75-ohm unbalanced transmission mode and are connected to the peer device using a pair of 75-ohm unbalanced coaxial cables. Several cable length options are available.

Figure 228 E3/T3 cable

The FIC-1AE3 and the FIC-1AT3 use the same type of cables for connection, which are called E3/T3 cables in this manual.

Connecting the Interface Cable

CAUTION: *By design, the FIC-1AE3 is protected against lightning strikes. But when outdoor cabling is involved, you are recommended to add a special lightning arrester at the input end of the E3/T3 cable for better protection.*

Step 1: Connect the SMB connector of an E3/T3 cable to the Tx port on the FIC-1AE3 and another end to the Rx port on another device.

Step 2: Connect the SMB connector of another E3/T3 cable to the Rx port on the FIC-1AE3 and another end to the Tx port on another device.

Step 3: Check the behavior of the LINK LED on the FIC-1AE3 panel: OFF means fault occurs on the line and the signal is out of synchronization. Check the line status.

FIC-1AT3

Introduction

FIC-1AT3, the 1-port 44 Mbps ATM-T3 interface card, provides these functions:

- Two ATM cell mapping modes: ADM and PLCP.
- Scrambling in data transmission.
- Line clock (when working as DTE interface) and internal clock (when working as DCE interface).

- Four types of test measures: local cell loopback, local loopback, remote payload loopback, and remote line loopback.

You may equip your router with FIC-1AT3 cards to its full capacity. Yet, you are recommended to install only one FIC-1AT3 on it, whatever its model is, to ensure performance of some key services.

Interface Attributes

The following table describes the interface attributes of the FIC-1AT3.

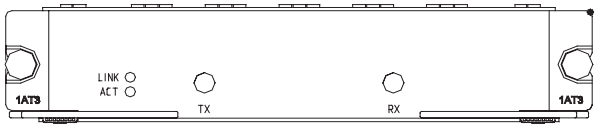
Table 131 Interface attributes of the FIC-1AT3

Attribute	FIC-1AT3
Connector	SMB
Number of connectors	2
Interface standard	G.703, G.704, G.823
Interface rate	44.736 Mbps
Interface cable	E3/T3 cable (75-ohm coaxial cables)
Supported services	ATM Traffic CBR, rt_VBR, nrt_VBR, UBR

Interface LEDs

The following figure illustrates the FIC-1AT3 panel:

Figure 229 FIC-1AT3 panel



The following table describes the LEDs on the FIC-1AT3 panel.

Table 132 LEDs on the FIC-1AT3 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The interface that the FIC-1AT3 provides uses two SMB sockets for data transmitting and receiving respectively. The ports adopt the 75-ohm unbalanced transmission mode and are connected to the peer device using a pair of 75-ohm unbalanced coaxial cables as shown in Figure 228. Several cable length options are available.

The FIC-1AT3 and FIC-1AE3 cards use the same type of cables for connection, which are called E3/T3 cables in this manual.

Connecting the Interface Cable

CAUTION: *By design, the FIC-1AT3 is protected against lightning strikes. But when outdoor cabling is involved, you are recommended to add a special lightning arrester at the input end of the E3/T3 cable for better protection.*

Step 1: Connect the SMB connector of an E3/T3 cable to the Tx port on the FIC-1AT3 and another end to the Rx port on another device.

Step 2: Connect the SMB connector of another E3/T3 cable to the Rx port on the FIC-1AT3 and another end to the Tx port on another device.

Step 3: Check the behavior of the LINK LED on the FIC-1AT3 panel: OFF means fault occurs on the line and the signal is out of synchronization. Check the line status.

FIC-1ATM-OC3MM/FIC-1ATM-OC3SM/ FIC-1ATM-OC3SML

Introduction

Three ATM fiber interface card options are available with your router:

- 1-port ATM 155 Mbps multi-mode fiber interface card (FIC-1ATM-OC3MM)
- 1-port ATM 155 Mbps single-mode fiber interface card (FIC-1ATM-OC3SM)
- 1-port ATM 155 Mbps single-mode long-haul fiber interface card (FIC-1ATM-OC3SML)

They provide the following functions:

- Two frame formats: SDH STM-1 and SONET OC-3.
- Scrambling in data transmission.
- Line clock (when working as DTE interface), and internal clock (when working as DCE interface)
- Three test measures: local cell loopback, local payload loopback and remote loopback.

For the ATM interface configuration procedures, refer to H3C MSR 20/30/50 Series Routers User Manual.

Interface Attributes

The following table describes the interface attributes of the ATM cards.

Table 133 Interface attributes of the ATM cards

Attribute	FIC-1ATM-OC3MM	FIC-1ATM-OC3SM	FIC-1ATM-OC3SML
Fiber-optic connector		SC	
Number of connectors		1	
Interface standard		SONET OC-3/SDH STM-1	
Interface rate		155 Mbps	

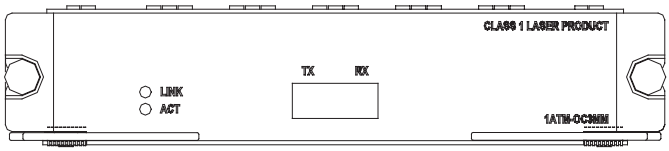
Table 133 Interface attributes of the ATM cards

Attribute	FIC-1ATM-OC3MM	FIC-1ATM-OC3SM	FIC-1ATM-OC3SML
Max. transmission segment over the selected cable	2 km (1.2 mi.) over the multi-mode optical fiber	15 km (9.3 mi.) over the single-mode optical fiber	Single-mode optical fiber of 30km transmission distance
Transmitter	LED	Laser	Laser
Optical transmitter power	Min: -21dBm Max: -14dBm	Min: -15dBm Max: -8dBm	Min: -5dBm Max: 0dBm
Receiver sensitivity	Min: -28 dBm Max: -8 dBm	Min: -30 dBm Max: -14 dBm	Min: -34 dBm Max: -10 dBm
Central wavelength		1310 nm	
Supported service		ATM traffic CBR, rt_VBR, nrt_VBR, UBR	

Interface LEDs

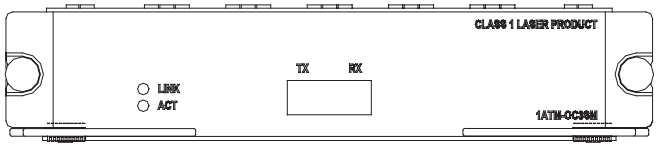
The following figure illustrates the FIC-1ATM-OC3MM panel.

Figure 230 FIC-1ATM-OC3MM panel



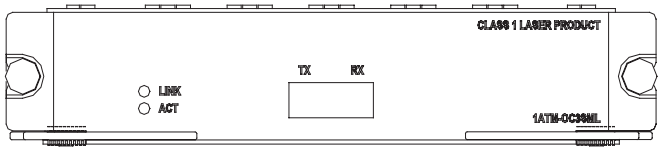
The following figure illustrates the FIC-1ATM-OC3SM panel.

Figure 231 FIC-1ATM-OC3SM panel



The following figure illustrates the FIC-1ATM-OC3SML panel.

Figure 232 FIC-1ATM-OC3SML panel



The following table describes the LEDs on the card panels.

Table 134 LEDs on the ATM card panels

LED	Description
LINK	OFF means no link is present; ON means a link is present.

Table 134 LEDs on the ATM card panels

LED	Description
ACT	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted and/or received.

Interface Optical Fiber

WARNING: *Laser danger: Invisible laser radiation may be emitted from the fiber-optic ports which are connected with lasers. To protect your eyes against radiation harm, never stare into an open fiber-optic port.*

CAUTION: *The FIC-1ATM-OC3SML provides a long-haul fiber interface. It requires transmission distance at least longer than 25 km (15.5 in.); otherwise, the interface cannot receive signals.*

The FIC-1ATM-OC3MM must be connected using the multi-mode optical fiber whereas the FIC-1ATM-OC3SM/ FIC-1ATM-OC3SML must be connected using the single-mode optical fiber.

FIC-1G.SHDSL

Introduction

FIC-1G.SHDSL, the 1-port single-pair high-speed digital subscriber line card, uses trellis coded pulse amplitude modulation (TCPAM) for coding and provides the symmetric rates up to 2.3 Mbps. Its transmission speed can automatically adapt to cable length and conditions.

Compared with ADSL, G.SHDSL allows longer transmission segment and as such, can serve a wider range of applications. It can substitute for E1/T1 lines to provide high-speed data service access. However, as TCPAM uses the band starting from 0 Hz for data transmission, G.SHDSL cannot share the same line with POTS or ISDN just like what ADSL has done.

The FIC-1G.SHDSL supports:

- Manual G.SHDSL line activation/deactivation and easy-to-use fault location tools.
- G.992.1-compliant interface and auto-sensing.

Interface Attributes

The following table describes the interface attributes of the FIC-1G.SHDSL.

Table 135 Interface attributes of the FIC-1G.SHDSL

Attribute	FIC-1G.SHDSL
Connector	RJ-11
Number of connectors	1
Interface standard	G.991.2

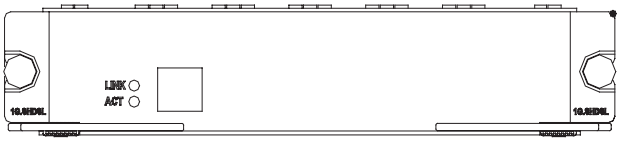
Table 135 Interface attributes of the FIC-1G.SHDSL

Attribute	FIC-1G.SHDSL
Interface rate	In single-pair mode, supports the sending/receiving independent symmetric rates in the range from 192 kbps to 2304 kbps in steps of 8 kbps.
Interface cable	Telephone cable
Supported services	G.SHDSL over telephone lines

Interface LEDs

The following figure illustrates the FIC-1G.SHDSL panel:

Figure 233 FIC-1G.SHDSL panel



The following table describes the LEDs on the FIC-1G.SHDSL panel.

Table 136 LEDs on the FIC-1G.SHDSL panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Cable

The FIC-1G.SHDSL cards use regular telephone cables for connection.

Connecting the Interface Cable

You simply need a telephone cable to connect the RJ11 interface on an FIC-1G.SHDSL card to PSTN.

FIC-1POS

Introduction

FIC-1POS, the 1-port SDH/SONET interface card, supports interface rates up to 155.52 Mbps (STM-1/OC-3).

The FIC-1POS uses the protocols such as PPP, Frame Relay and HDLC at the data link layer and IP at the network layer. It allows direct transmission of packets over SONET/SDH. It supports:

- Four types of SFP: multi-mode short-haul (1310 nm), single mode medium-haul (1310 nm), single mode long-haul (1310 nm), and single-mode ultra-long haul (1550 nm).
- 155.52 Mbps fractional interface

Interface Attributes

The following table describes the interface attributes of the FIC-1POS.

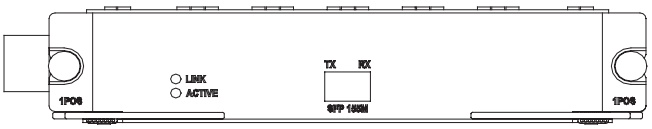
Table 137 Interface attributes of the FIC-1POS

Attribute		FIC-1POS			
Connector		SFP/LC			
Interface standard		SONET OC-3/SDH STM-1			
Number of interfaces		1			
Interface rate		155.52 Mbps			
Optical transmitter power	Type	Multi-mode short-haul	Single mode medium-haul	Single mode long-haul	Single mode ultra-long haul
	Min.	-19.0 dBm	-15.0 dBm	-5.0 dBm	-5.0 dBm
	Max.	-14.0 dBm	-8.0 dBm	0. dBm	0. dBm
Receiver sensitivity		-30.0 dBm	-28.0 dBm	-34.0 dBm	-34.0 dBm
Overload optical power		-14.0 dBm	-7.0 dBm	-9.0 dBm	-10.0 dBm
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Fiber type		62.5/125 μm multi-mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode
Max. transmission segment		2 km (1.2 mi.)	15 km (9.3 mi.)	40 km (24.9 mi)	80 km (49.7 mi)

Interface LEDs

The following figure illustrates the FIC-1POS panel:

Figure 234 FIC-1POS panel



The following table describes the LEDs on the FIC-1POS panel.

Table 138 LEDs on the FIC-1POS panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or/and transmitted.

Interface Optical Fiber

Like the FIC-1CPOS, the FIC-1POS uses optical fibers with LC-type connectors.

Connecting the Interface Optical Fiber

Step 1: Insert the SFP card into its corresponding slot.

Step 2: Locate the Rx and Tx fiber-optic interfaces on the interface card. Use two fibers to connect the FIC-1POS to another device: Rx to Tx and Tx to Rx.

Step 3: Power on the device and check the LINK LED on the FIC-1POS panel: ON means the Rx link is present and OFF means the opposite. In the latter case, check the line status.

WARNING: *Because invisible laser radiation may be emitted from the aperture of an optical port when no fiber is connected or the dust cap is removed, do not stare into the open aperture.*

Replace the dust cap when no fiber is connected to the optical port.

FIC-2FXS/FIC-2FXO/FIC-2E&M and FIC-4FXS/FIC-4FXO/FIC-4E&M

Introduction

FIC-2FXS/FIC-4FXS, the 2-/4-port voice subscriber circuit interface card, processes and transmits over data communications networks voice signals for 2/4 regular analog phones, faxes, or AT0 loop trunks of telephone exchanges.

FIC-2FXO/FIC-4FXO, the 2-/4-port voice AT0 analog trunk interface card, processes and transmits over data communications networks voice signals for 2/4 loops of telephone exchanges.

FIC-2E&M/FIC-4E&M, the 2-/4-port voice E&M analog trunk interface card, provides and transmits over data communications networks voice signals for 2/4 E&M analog trunks.

CAUTION: *When connecting the FIC-2FXS/FIC-2FXO/FIC-2E&M or the FIC-4FXS/FIC-4FXO/FIC-4E&M, make sure your router has access to an IP network or some other WAN.*

Interface Attributes

The following table describes the interface attributes of the FIC-2FXS/FIC-2FXO/FIC-2E&M and the FIC-4FXS/FIC-4FXO/FIC-4E&M.

Table 139 Interface attributes of the FIC-2FXS/FIC-2FXO/FIC-2E&M and the FIC-4FXS/FIC-4FXO/FIC-4E&M

Attribute	Description
Connector	RJ-45
Number of connectors	2 (FIC-2FXS/FIC-2FXO/FIC-2E&M)
	4 (FIC-4FXS/FIC-4FXO/FIC-4E&M)
Cable	Telephone cable with ferrite core
	E&M trunk cable (only for E&M cards, made on site)

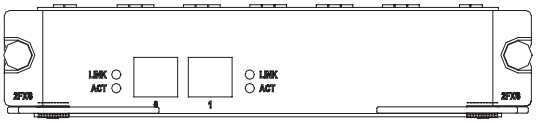
Table 139 Interface attributes of the FIC-2FXS/FIC-2FXO/FIC-2E&M and the FIC-4FXS/FIC-4FXO/FIC-4E&M

Attribute	Description
Interface standard	ITU Q.512-compliant subscriber circuit interface (FIC-2FXS/FIC-4FXS)
	ITU Q.552-compliant loop trunk interface (FIC-2FXO/FIC-4FXO)
	G.712-compliant E&M trunk interface (FIC-2E&M/FIC-4E&M), E&M interface (supporting Bell type I, II, III, and V, using both two-wire and four-wire implementations)
	ITU K.20-compliant overcurrent protection
Dial-up mode	Dual-tone multifrequency (DTMF), compliant with GB3378
	(Pulse dial is not available.)
Bandwidth	300 Hz to 3400 Hz

Interface LEDs

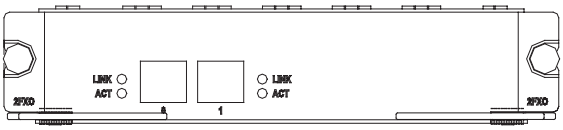
The following figure illustrates the FIC-2FXS panel:

Figure 235 FIC-2FXS panel



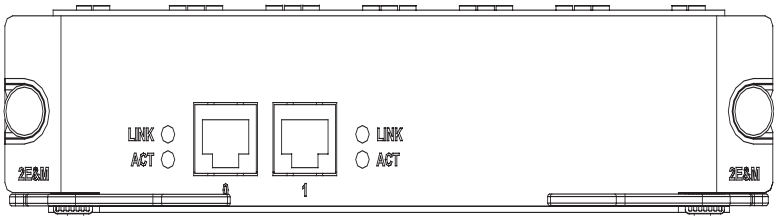
The following figure illustrates the FIC-2FXO panel:

Figure 236 FIC-2FXO panel



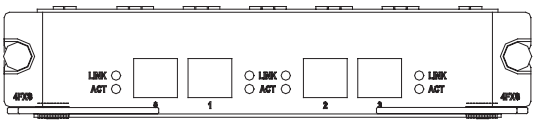
The following figure illustrates the FIC-2E&M panel:

Figure 237 FIC-2E&M panel



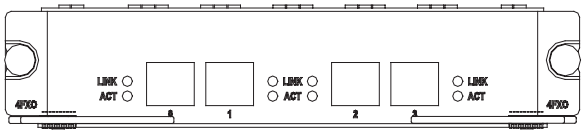
The following figure illustrates the FIC-4FXS panel:

Figure 238 FIC-4FXS panel



The following figure illustrates the FIC-4FXO panel:

Figure 239 FIC-4FXO panel



The following figure illustrates the FIC-4E&M panel:

Figure 240 FIC-4E&M panel

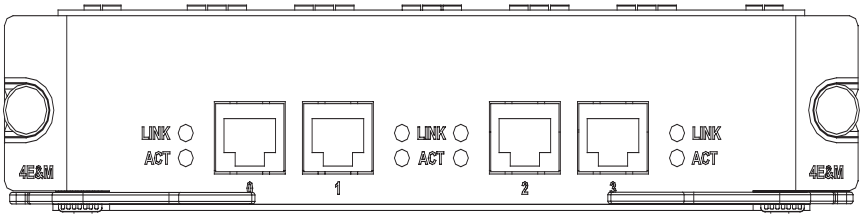


Table 140 LEDs on the FIC-FXS/FIC-FXO/FIC-E&M panel

LED	Description
LINK	OFF means no link is present.
	ON means a link is present.
ACT	OFF means the channel is idle.
	ON means there is call activity.

Interface Cable

- *RJ-45 receptacles on the FIC-FXO/FIC-FXS/FIC-E&M cards adopt RJ-45 connectors.*
- *The standard equipping package for the FIC-2FXS/FIC-2FXO and the FIC-4FXS/FIC-4FXO includes the appropriate number of regular telephone cables.*

Interface cables for the FIC-FXS/FIC-FXO cards

Interface cables for FIC-2FXS/FIC-2FXO and FIC-4FXS/FIC-4FXO are telephone cables with ferrite core. For cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual*.

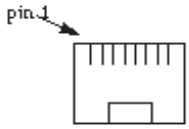
Interface cables for FIC-E&M cards

E&M cards available with H3C Series Routers support Bell I, II, III, V switches, and use 2-wire and 4-wire voice implementations.

When connecting a switch to your router, a Bell V four-wire connection is preferred.

The following figure shows the pinouts of RJ-45 receptacle on E&M cards. The pins are numbered 1 to 8 from left to right:

Figure 241 Pinouts of RJ-45 receptacle



When connection is made in Bell V 4-wire mode, the pinouts of RJ-45 receptacles at router side and at the switch side are shown in the following figure:

Figure 242 E&M interface cable (Bell V 4-wire)

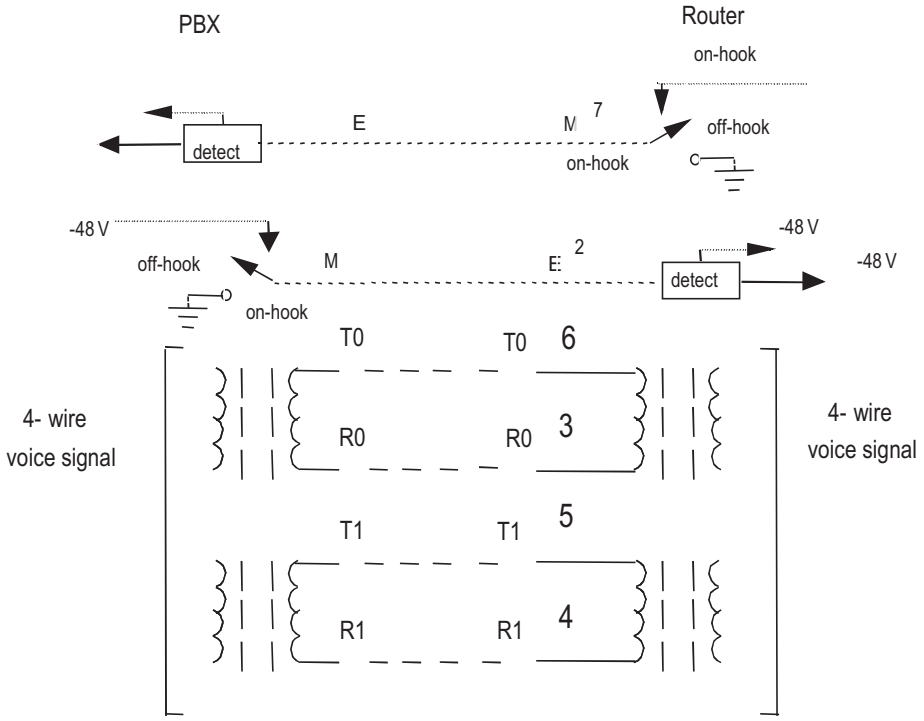


Table 141 Pinouts of E&M interface cable (Bell V 4-wire)

Router side		Signal at switch side (Bell V 4-wire)
RJ-45 Pin	**Signal**	
1	SB (negative power supply)	-
2	E	M
3	RING0	RING0
4	RING1	RING1
5	TIP1	TIP1
6	TIP0	TIP0
7	M	E

Table 141 Pinouts of E&M interface cable (Bell V 4-wire)

Router side		
RJ-45 Pin	**Signal**	**Signal at switch side (Bell V 4-wire)**
8	SG (negative power supply ground)	-

- *Because it is hard to know the type of the switch to be connected and the connectors used by the switch, you need to make interface cables for connecting the FIC-2E&M/FIC-4E&M card on site.*
- *To ensure the EMC of the router, install a ferrite core near the connector of the self-made E&M interface cable by the router side.*

Connecting the Interface Cable

CAUTION:

- *If outdoor cabling is involved, consider to install a special lightning arrester at the input end of the interface cable for better lightning protection.*
- *Before you connect a port, read its label carefully; a wrong connection can cause damages to the interface card and even the device.*
- *According to Bell V, cables for FXS/FXO/E&M cards do not provide a PGND wire. For this reason, a loop should be formed through the earth ground between the router and the connected switch. In practice, the PGND wire of the switch can be connected to the chassis of the router.*
- *In connecting an interface cable, note to connect the end with ferrite core to the router for EMC sake.*

Step 1: Insert the ferrite core end of the cable into the to-be-connected RJ-45 port on the interface card.

Step 2: Connect the other end of the cable as follows:

- For an FIC-FXS card, connect to a phone-set, fax or AT0 loop trunk of telephone exchange.
- For an FIC-FXS, connect to a regular subscriber line of telephone exchange.
- For an E&M card, connect to an E&M trunk on the telephone exchange.

FIC-HNDE

Introduction

FIC-HNDE, the high network data encryption card, delivers IPSec and hardware-based IP packet encryption. It supports multiple hardware encryption/decryption and hash algorithms, thus providing encryption with high performance and reliability.

The FIC-HNDE is intended for low-end and mid-range modular routers. Installed with an FIC-HNDE, the main board of your router can implement VPN with encryption provided by the FIC-HNDE in addition to IP packet forwarding.

Interface Features

The following table describes the interface attributes of the FIC-HNDE.

Table 142 Interface attributes of the FIC-HNDE

Attribute	Description
Protocol supported	IPSec
Hardware algorithm	key algorithm (DES, 3DES, AES)
	Authentication algorithm (HMAC-MD5-96, HMAC-SHA-1-96)

Panel and LEDs

The following figure illustrates the FIC-HNDE panel:

Figure 243 FIC-HNDE panel

The following table describes the LEDs on the FIC-HNDE panel.

Table 143 LEDs on the FIC-HNDE

LED	Description
STATUS	Solid green: Power is being supplied to the FIC-HNDE normally.
	OFF: The card is not powered, the power supply of the card has failed or a serious hardware fault occurs.
ACTIVE	OFF after two-second flashing (yellow): The card finishes initialization.
	Blinking: The card operates normally and data is being transmitted or received.
	OFF: The card is operating normally but not sending or receiving data.

Troubleshooting

You may learn how well the encryption card is operating by reading the LEDs on it.

For the correct LED behaviors, refer to Table 143.

Table 144 Troubleshooting by reading the LED behaviors

Incorrect LED behaviors	Reason	Action to take
STATUS LED remains OFF at router startup.	The card or some hardware parts on the card are not supplied with power properly.	1) Check that the power supply of the router is correctly connected.
		2) Check that the power is being supplied.
		3) Contact your sales agent for help: the power supply of the card may have been damaged or anomalies have occurred to the CPLD.

Table 144 Troubleshooting by reading the LED behaviors

Incorrect LED behaviors	Reason	Action to take
ACTIVE LED remains OFF at device startup.	The encryption processor failed to initialize the configurations possibly due to a system bus problem.	1) Check that the card is securely connected to the host. 2) Contact your sales agent for help: the host or the card may be problematic.
ACTIVE LED is solid ON or OFF when the card is operating.	The system bus is not working properly.	1) Check that the card is securely connected to the host. 2) Contact your sales agent for help: the host or the card may be problematic.

FIC-2VE1

Introduction

2-port E1 voice interface module (FIC-2VE1) can handle dense voice signals in VoIP system. It provides two CE1/PRI/R2 ports, allowing the access of 60 channels of voice signals.

- *VCPM is provided to users together with FIC-2VE1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of FIC-2VE1.*

Interface Attributes

The interface attributes of FIC-2VE1 are given in the following table.

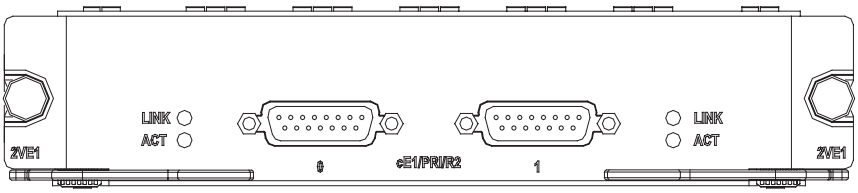
Table 145 Interface attributes of FIC-2VE1

Attribute	Description
Connector	DB-15
Number of connectors	2
Operating mode	CE1
	ISDN PRI
	R2
Interface rate	2.048 Mbps
Cable	E1 120-ohm balanced twisted pair cable
	75ohm-to-120ohm adapter
	Network interface connector
Supported service	1) R2 signaling
	2) DSS1 signaling
	3) IP Fax
	4) General VoIP features in Comware

Interface LEDs

FIC-2VE1 panel is shown in the following figure:

Figure 244 FIC-2VE1 panel



Description of the LEDs on FIC-2VE1 panel is given in the following table:

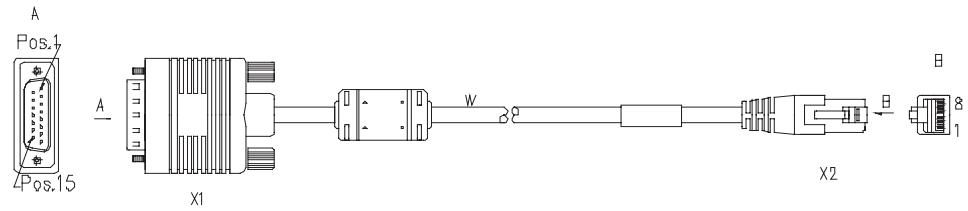
Table 146 Description of the LEDs on FIC-2VE1 panel

LED	Description
LINK	OFF means no link is present;
	ON means a link is present.
ACTIVE	OFF means no data is being transmitted or received.
	Blinking means there is data being transmitted or received.

Interface Cable

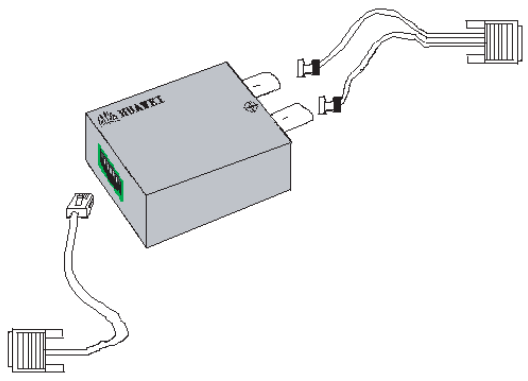
FIC-2VE1 interface cables are G.703-compliant 120-ohm balanced twisted pair cables. At one end of the cable is a DB-15 male connector for the connection to the Router, and at the other end is an RJ-45 connector for the connection to the network.

Figure 245 E1 120-ohm balanced twisted pair cable



If the cable with the resistance of 75-ohm is needed, a 75-ohm-to-120-ohm cable adapter (one end is BNC connector and the other end is RJ-45 connector) which is illustrated in the following figure can be installed.

Figure 246 75-ohm-to-120-ohm adapter (with BNC connector)



CAUTION:

- *For the convenience of extending the connection of E1 120-ohm balanced twisted pair cable, you can use network interface connector.*
- *E1 120-ohm balanced twisted pair cable, network interface connector, 75-ohm-to-120-ohm adapter are optional accessories. Please select one when purchasing a FIC-2VE1 module; by default, they are not provided.*

For cable pinouts, see *Low-End and Mid-Range Series Routers Cable Manual*.

Connecting the Interface Cable

CAUTION:

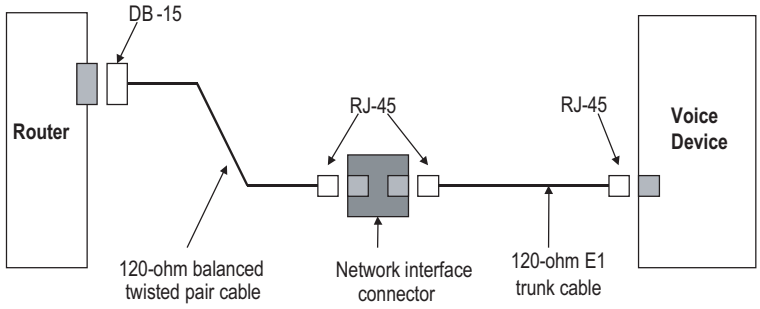
- *Some measures are taken to protect FIC-2VE1 module. Still, you are recommended to install a special lightning arrester at the input end of its connection cable to obtain better lightning protection when the cable is led outdoors;*
- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage the FIC and even the Router.*

Step 1: Plug the DB-15 connector of the cable into the DB-15 port on the FIC-2VE1 module and fasten the screws;

Step 2: Connect the RJ-45 connector of the cable to:

- The peer device directly, if the resistance of the port to be connected is 120-ohm, and there is no need to extend the cable;
- A network interface connector and then the peer device using another E1 120-ohm balanced twisted pair cable, if the resistance of the port to be connected is 120-ohm, and there is a need to extend the cable, as illustrated in the following figure.

Figure 247 Extending E1 120-ohm balanced twisted pair cable



- The peer device using a 75ohm-to-120ohm adapter, if the resistance of the peer device is 75-ohm;

Step 3: Power on the Router and check the LINK LED on the FIC-2VE1 panel. It is OFF when fault has occurred on the link. In this case, please check the link.

FIC-2VT1

Introduction

2-port T1 voice interface module (FIC-2VT1) can handle dense voice signals in VoIP system. It provides two CE1/PRI ports, allowing the access of 48 channels of voice signals.

- *VCPM is provided to users together with FIC-2VT1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of FIC-2VT1.*

Interface Attributes

The interface attributes of FIC-2VT1 are given in the following table.

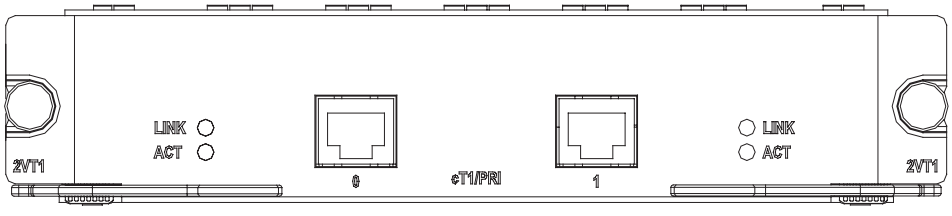
Table 147 Interface attributes of FIC-2VT1

Attribute	Description
Connector	RJ45
Number of connector	2
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm standard shielded cable)
Operation mode	CT1
	ISDN PRI
Services	Backup
	Terminal access
	ISDN

Interface LEDs

FIC-2VT1 panel is shown in the following figure:

Figure 248 FIC-2VT1 panel



Description of the LEDs on FIC-2VT1 panel is given in the following table:

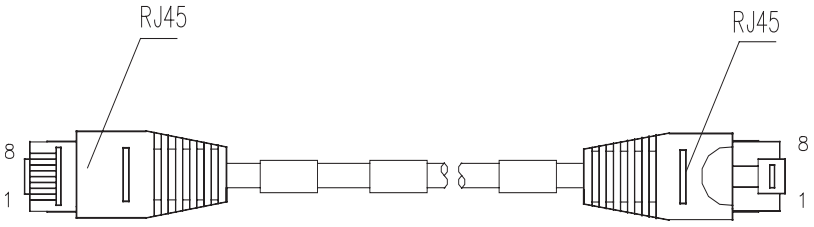
Table 148 Description of the LEDs on FIC-2VT1 panel

LED	Description
LINK	ON means carrier signal is received;
	OFF means no carrier signal is received.
ACT	OFF: No data is being received and transmitted;
	Blinking: Data is being received and transmitted.

Interface Cable

The interface cable of FIC-2VT1 is a standard 100-ohm standard shielding cable. The connectors on the two ends use RJ 45. The following figure illustrates this type of cable.

Figure 249 T1 cable



You can also use a network interface connector to extend the FIC-2VTI cable.

CAUTION: *The FIC-2VTI cable and network interface connector are optional. Please order them together with FIC-2VT1. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the card and even damage the router.*
- *When using T1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the FIC has been properly installed, follow these steps to connect the cable:

Step 1: Plug one end of T1 cable into the RJ45 connector of FIC-2VT1.

Step 2: Connect the other end of T1 cable to the peer device;

Step 3: Check the status of LINK LED on the FIC-2VT1 panel: OFF means the link is not connected. In the latter case, check the line.

FIC-1VE1

Introduction

1-port E1 voice interface module (FIC-1VE1) can handle dense voice signals in VoIP system. It provides a CE1/PRI/R2 port, allowing the access of 30 channels of voice signals.

- *VCPM is provided to users together with FIC-1VE1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of FIC-1VE1.*

Interface Attributes

The interface attributes of FIC-1VE1 are given in the following table.

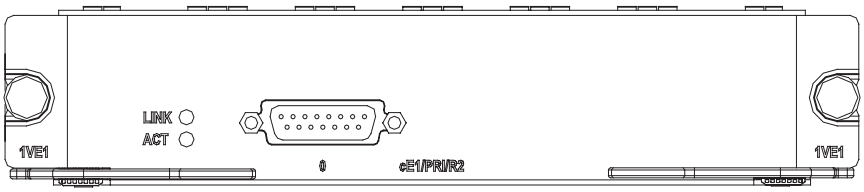
Table 149 Interface attributes of FIC-1VE1

Attribute	Description
Connector	DB-15
Number of connectors	1
Operating mode	CE1
	ISDN PRI
	R2
Interface rate	2.048 Mbps
Cable	E1 120-ohm balanced twisted pair cable
	75ohm-to-120ohm adapter
	Network interface connector
Supported service	1) R2 signaling
	2) DSS1 signaling
	3) IP Fax
	4) General VoIP features in Comware

Interface LEDs

FIC-1VE1 panel is shown in the following figure:

Figure 250 FIC-1VE1 panel



Description of the LEDs on FIC-1VE1 panel is given in the following table:

Table 150 Description of the LEDs on FIC-1VE1 panel

LED	Description
LINK	OFF means no link is present;
	ON means a link is present.

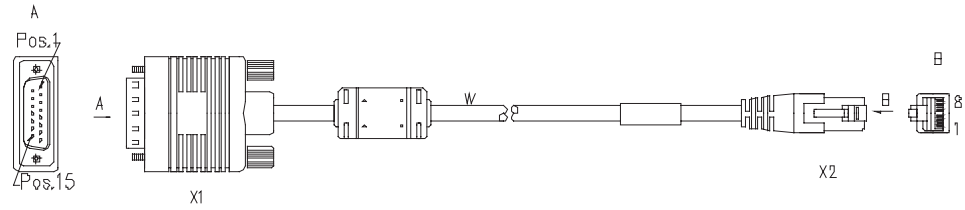
Table 150 Description of the LEDs on FIC-1VE1 panel

LED	Description
ACTIVE	OFF means no data is being transmitted or received. Blinking means there is data being transmitted or received.

Interface Cable

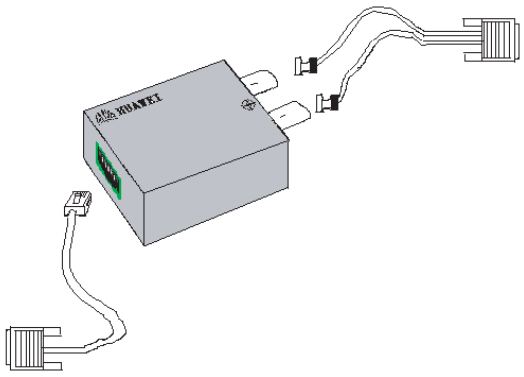
FIC-1VE1 interface cables are G.703-compliant 120-ohm balanced twisted pair cables. At one end of the cable is a DB-15 male connector for the connection to the Router, and at the other end is an RJ-45 connector for the connection to the network.

Figure 251 E1 120-ohm balanced twisted pair cable



If the cable with the resistance of 75-ohm is needed, a 75-ohm-to-120-ohm cable adapter (one end is BNC connector and the other end is RJ-45 connector) which is illustrated in the following figure can be installed.

Figure 252 75-ohm-to-120-ohm adapter (with BNC connector)



CAUTION:

- *For the convenience of extending the connection of E1 120-ohm balanced twisted pair cable, you can use network interface connector.*
- *E1 120-ohm balanced twisted pair cable, network interface connector, 75-ohm-to-120-ohm adapter are optional accessories. Please select one when purchasing a FIC-1VE1 module; by default, they are not provided.*

Connecting the Interface Cable

CAUTION:

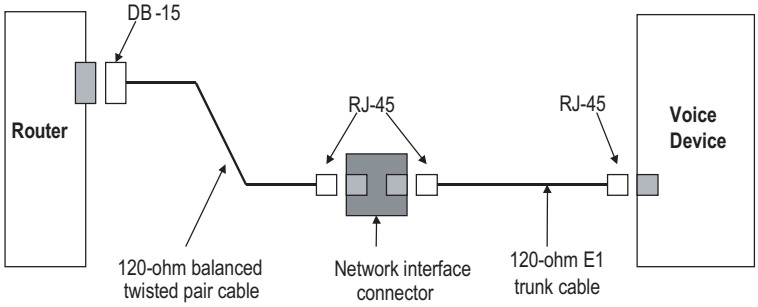
- *Some measures are taken to protect FIC-1VE1 module. Still, you are recommended to install a special lightning arrester at the input end of its connection cable to obtain better lightning protection when the cable is led outdoors;*
- *Read the mark identifying a port before you connect a cable to it, making sure it is the correct port. Wrong connection tends to damage the MIM and even the Router.*

Step 1: Plug the DB-15 connector of the cable into the DB-15 port on the FIC-1VE1 module and fasten the screws;

Step 2: Connect the RJ-45 connector of the cable to:

- The peer device directly, if the resistance of the port to be connected is 120-ohm, and there is no need to extend the cable;
- A network interface connector and then the peer device using another E1 120-ohm balanced twisted pair cable, if the resistance of the port to be connected is 120-ohm, and there is a need to extend the cable, as illustrated in the following figure.

Figure 253 Extending E1 120-ohm balanced twisted pair cable



- The peer device using a 75ohm-to-120ohm adapter, if the resistance of the peer device is 75-ohm;

Step 3: Power on the Router and check the LINK LED on the FIC-1VE1 panel. It is OFF when fault has occurred on the link. In this case, please check the link.

FIC-1VT1

Introduction

1-port T1 voice interface module (FIC-1VT1) can handle dense voice signals in VoIP system. It provides a CT1/PRI port, allowing the access of 24 channels of voice signals.

- *VCPM is provided to users together with FIC-1VT1. Users can select VPM module as needed.*
- *VPM module is installed on the main board of FIC-1VT1.*

Interface Attributes

The interface attributes of FIC-1VT1 are given in the following table.

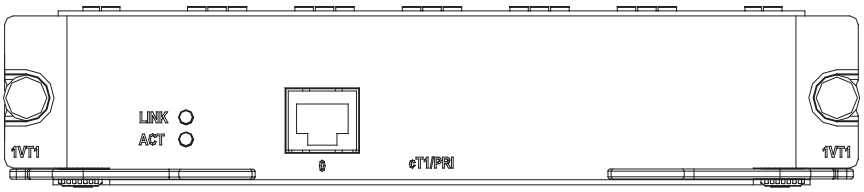
Table 151 Interface attributes of FIC-1VT1

Attribute	Description
Connector	RJ45
Number of connector	1
Interface standard	G.703/T1.102
	G.704
	AT&T TR 54016
	AT&T TR 62411
	ANSI T1.403
Interface rate	1.544 Mbps
Cable type	T1 cable (100-ohm standard shielded cable)
Operation mode	CT1
	ISDN PRI
Services	Backup
	Terminal access
	ISDN

Interface LEDs

FIC-1VT1 panel is shown in the following figure:

Figure 254 FIC-1VT1 panel



Description of the LEDs on FIC-1VT1 panel is given in the following table:

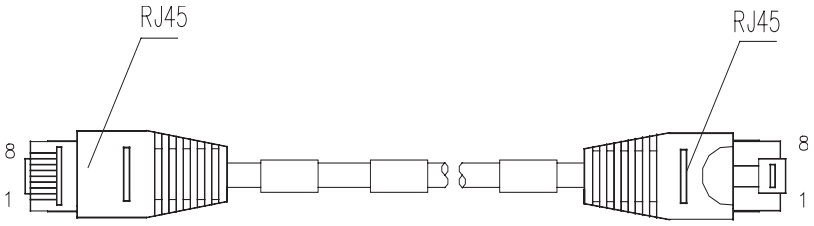
Table 152 Description of the LEDs on FIC-1VT1 panel

LED	Description
LINK	ON means carrier signal is received;
	OFF means no carrier signal is received.
ACT	OFF: No data is being received and transmitted;
	Blinking: Data is being received and transmitted.

Interface Cable

The interface cable of FIC-1VT1 is a standard 100-ohm standard shielding cable. The connectors on the two ends use RJ 45. The following figure illustrates this type of cable.

Figure 255 T1 cable



You can also use a network interface connector to extend the FIC-1VTI cable.

CAUTION: *The corresponding cables are not included in the standard shipment package of FIC-1VT1. Please order them together with FIC-1VT1. By default, they are not supplied.*

Connecting the Interface Cable

CAUTION:

- *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the card and even damage the router.*
- *When using T1 cable outdoors, you are recommended to install a special lightning arrester on the input end of the cable in order to avoid lightning more effectively.*

If the FIC has been properly installed, follow these steps to connect the cable:

Step 1: Plug one end of T1 cable into the RJ45 connector of FIC-1VT1.

Step 2: Connect the other end of T1 cable to the peer device;

Step 3: Check the status of LINK LED on the FIC-1VT1 panel: OFF means the link is not connected. In the latter case, check the line.

FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE

Introduction

The 16/24-port 10/100 Mbps Ethernet Layer 2 switching MIM interface module (FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE) is used on H3C MSR 50 series router. A router installed with FIC-16FSW/DFIC-24FSW modules can work as a switching/routing integrated device on a small-sized enterprise network to connect PCs and network devices inside the network directly. The interfaces provided on the FIC-16FSW/FIC-16FSW-PoE and DFIC-24FSW/DFIC-24FSW-PoE are as follows:

FIC-16FSW/FIC-16FSW-PoE provides:

- 16 10/100 Mbps RJ45 connector interfaces on the FIC-16FSW module
- One 10/100/1000 Mbps gigabit RJ45 connector electrical interfaces on the FIC-16FSW module

- 1 SFP fiber interface (Fiber interfaces and gigabit electrical interfaces share the MAC layer) on the FIC-16FSW module

DFIC-24FSW/DFIC-24FSW-PoE provides:

- 24 10/100 Mbps RJ45 connector interfaces on the DFIC-24FSW module
- 2 10/100/1000 Mbps gigabit RJ45 connector electrical interfaces on the DMIM-24FSW module
- 2 SFP fiber interfaces (Fiber interfaces and gigabit electrical interfaces share the MAC layer) on the DMIM-24FSW module. By default, the electrical interfaces take effect.

The modules support:

- 100 meters (328.1 ft.) of transmission distance over the category-5 twisted-pair cable
- 100 meters (328.1 ft.) of transmission distance between any interfaces over the category-5 twisted-pair cable
- Operation at 100 Mbps and 10 Mbps, autosensing
- Full duplex and half-duplex, with the former in common use

Interface Attributes

The interface attributes of the FIC-16FSW/DFIC-24FSW are given in the following table:

Table 153 Interface attributes of the FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE

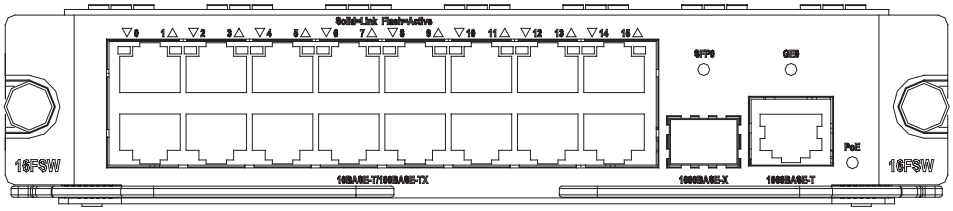
Attribute	FIC-16FSW/FIC-16FSW-PoE module	DFIC-24FSW/DFIC-24FSW-PoE module
Connector	RJ45	
	SFP	
Interface type	MDI/MDIX	
Number of connectors	16 × 100 Mbps RJ45 connectors	24 × 100 Mbps RJ45 connectors
	one 1000 Mbps RJ45 connectors	Two 1000 Mbps RJ45 connectors
	One SFP connector	Two SFP connectors
Cable type	Standard (straight-through) Ethernet cable	
	Crossover Ethernet cable	
Operating mode	10/100 Mbps autosensing	
	Full/half duplex	

MDI stands for Media Dependent Interface of the Ethernet. Normally, the interfaces on the network cards belong to this type. MDIX stands for Cross Media Dependent Interface, which is usually adopted on HUBs or LAN Switches.

Interface LEDs

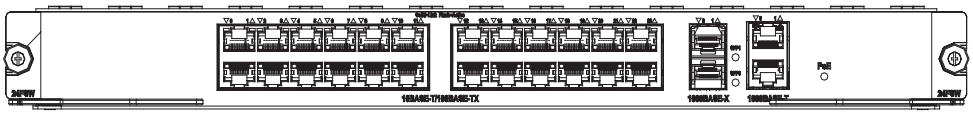
FIC-16FSW/FIC-16FSW-PoE panel is shown in the following figure:

Figure 256 FIC-16FSW/FIC-16FSW-PoE panel



DFIC-24FSW/DFIC-24FSW-PoE panel is shown in the following figure:

Figure 257 DFIC-24FSW/DFIC-24FSW-PoE panel



On the FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE panel each port on the network connector corresponds with one green LED. The following table describes the LEDs on the FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE panel.

Table 154 LEDs on the FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE FE interface

LED	Description
Steady green	A link is present, but no data is being transmitted and received.
OFF	No link is present.
Blinking green	A link is present and data is being transmitted and received (ACT).

The following table describes the LEDs on the GE port and SFP fiber interface:

Table 155 LEDs on the FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE GE interface

LED	Description
OFF	No link is present.
Steady green	A 1000 Mbps link is present, but no data is being transmitted and received.
Blinking green	A 1000 Mbps link is present and data is being transmitted and received (ACT).
Steady yellow	A 100 Mbps link is present, but no data is being transmitted and received.
Blinking yellow	A 100 Mbps link is present and data is being transmitted and received (ACT).

Table 156 LEDs on the FIC-16FSW/FIC-16FSW-PoE/DFIC-24FSW/DFIC-24FSW-PoE fiber interface

LED	Description
OFF	No link is present.
Steady green	A link is present, but no data is being transmitted and received.
Blinking green	A link is present and data is being transmitted and received (ACT).
Steady yellow	Error prompt

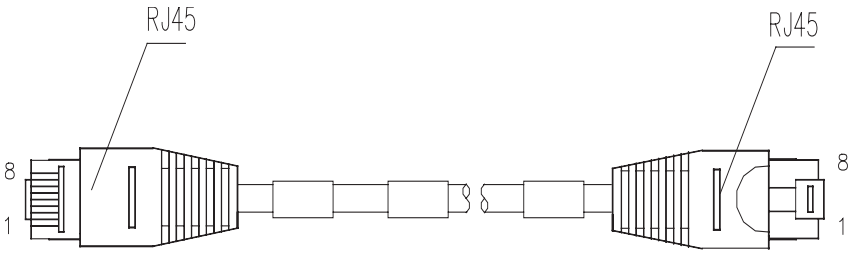
In addition, there is a POE LED on each card, which is provided for the corresponding boards (FIC-16FSW-PoE and DFIC-24FSW-PoE) with the PoE function.

The two GE interfaces on the DFIC-24FSW-PoE do not support the PoE function.

Interface Cable

Normally, category-5 twisted pair cable is adopted to connect the 10BASE-T /100BASE-TX Ethernet interface to the Ethernet, as shown in the following figure:

Figure 258 Ethernet cable



Ethernet cables fall into two categories: straight-through cables and crossover cables, specifically,

- Straight-through cable: The sequences of the twisted pairs crimped by RJ-45 connectors at both ends are the same. It is used for the connection between a terminal device (e.g., PC and router) and a Hub/LAN Switch. The cables delivered with the Router are straight-through cables.
- Crossover cable: The sequences of the twisted pairs crimped by RJ-45 connectors at both ends are different. It is used for the connection between terminal devices (e.g., PC and router). And it can be made by the user.

For the pinouts of straight-through Ethernet cable and crossover Ethernet cable, see *Low-End and Mid-Range Series Routers Cable Manual.*

Connecting the Interface Optic Fiber

Connecting Ethernet fiber interface cable

CAUTION: *When connecting the optical fiber, observe the following*

- *Do not over-bend the optical fiber. Its curvature radius must be no less than 10 cm (3.9 in).*
- *Ensure that the Tx and Rx ends are correctly connected.*

- *Ensure that the fiber ends are clean.*

WARNING: *Laser danger: Invisible laser radiation may be emitted from the fiber-optic ports which are connected to lasers. To protect your eyes against radiation harm, never stare into an open fiber-optic port.*

Step 1: Insert the SFP optical module into its corresponding slot.

Step 2: Locate the Rx and Tx ports of the GE interface. Connect them to another device with two optical fibers: Rx to Tx and Tx to Rx.

Step 3: Check the status of LINK LED on the GE interface: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

Connecting Ethernet electrical cable

Step 1: (Use a crossover cable for the connection to a PC/router and straight-through cable to a Hub/LAN Switch.) Plug one end of the cable to an Ethernet port of the Router and another end to the desired peer device;

Step 2: Check the status of LINK LED on the FE module panel: ON means the link is connected and OFF means the link is not connected. In the latter case, check the line.

FIC-IMA-4E1/FIC-IMA-8E1

Introduction

The 4-port/8-port E1 ATM inverse multiplexing interface card (FIC-IMA-4E1/FIC-IMA-8E1) provides four/eight E1 interfaces that support the IMA (inverse multiplexing for ATM) technology.

The IMA technology combines multiple low-speed links into a group to support a high-speed ATM cell stream: It distributes an ATM cell stream over multiple low-speed E1 links on cell by cell basis at the transmission end and reassembles the cells on the low-speed E1 links into the original stream at the far end. This technology provides a scalable and cost-effective solution, and is commonly used in PDH networks to transport ATM cells.

Interface Attributes

The following table describes the interface attributes of the FIC-IMA-4E1/FIC-IMA-8E1:

Table 157 Interface attributes of the FIC-IMA-4E1/FIC-IMA-8E1

	Description			
Attribute	**FIC-IMA-4E1 (75-ohm)**	**FIC-IMA-8E1 (75-ohm)**	**FIC-IMA-4E1 (120-ohm)**	**FIC-IMA-8E1 (120-ohm)**
Connector	DB-68			
Number of connectors	1			
Interface standard	ITU-G.703, ITU-G.704			
Interface rate	2.048 Mbps			

Table 157 Interface attributes of the FIC-IMA-4E1/FIC-IMA-8E1

Attribute	Description			
	FIC-IMA-4E1 (75-ohm)	**FIC-IMA-8E1 (75-ohm)**	**FIC-IMA-4E1 (120-ohm)**	**FIC-IMA-8E1 (120-ohm)**
Cable type	75-ohm 4E1 conversion cable	75-ohm 8E1 conversion cable	120-ohm 4E1 conversion cable	120-ohm 8E1 conversion cable
Max transmission distance	500 m (1640.4 ft.)		150 m (492.1 ft.)	
Operating mode	ATM E1 independent link/IMA bundle mode			
Supported service	AAL5			
Protocol	PPPoA, PPPoEoA, IPoA, IPoEoA			
Transmission rate	CBR/VBR-rt/VBR-nrt/UBR			

Interface LEDs

The following figures illustrate the FIC-IMA-4E1 and FIC-IMA-8E1 (75-ohm) panels:

Figure 259 75-ohm FIC-IMA-4E1 panel

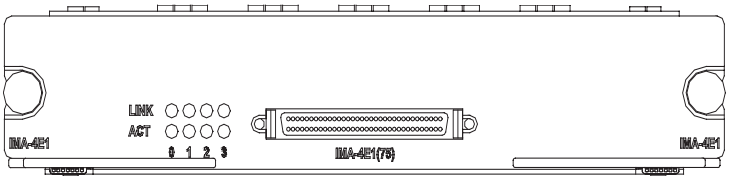
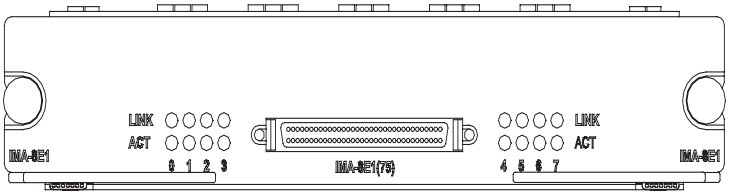


Figure 260 75-ohm FIC-IMA-8E1 panel



The following table describes the LEDs on the FIC-IMA-4E1/FIC-IMA-8E1 panel:

Table 158 LEDs on the FIC-IMA-4E1/FIC-IMA-8E1 panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or transmitted.

Interface Cable

The FIC-IMA-4E1 card provides four E1 ports and uses a 120-ohm or 75-ohm 4E1 conversion cable. The two types of 4E1 conversion cables look similar. Both of them have a DB-68 connector at one end for connecting the router. However, the 75-ohm 4E1 conversion cable contains eight coaxial cables and the 120-ohm 4E1 conversion cable contains four twisted pairs.

The FIC-IMA-8E1 card provides eight E1 ports and uses a 120-ohm or 75-ohm 8E1 conversion cable. The two types of 8E1 conversion cables look similar. Both of them have a DB-68 connector at one end for connecting the router. However, the 75-ohm 8E1 conversion cable contains 16 coaxial cables and the 120-ohm 8E1 conversion cable contains eight twisted pairs, as shown in the following figures:

Figure 261 75-ohm 8E1 conversion cable

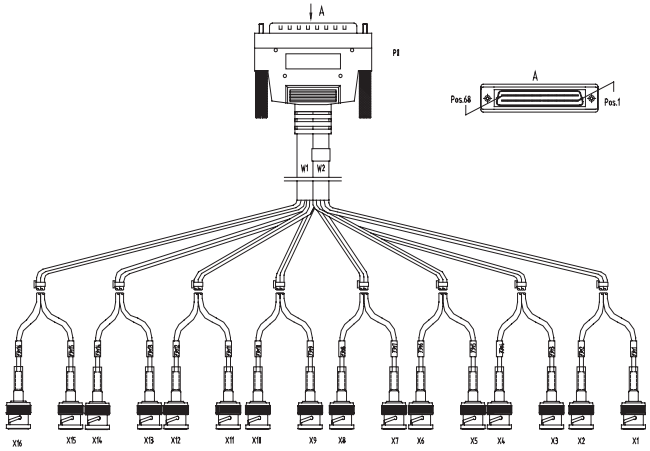
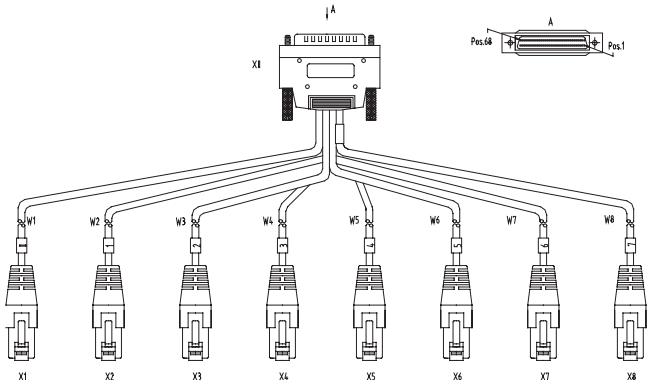


Figure 262 120-ohm 8E1 conversion cable



Connecting the Interface Cable

Step 1: Choose a 4E1/8E1 conversion cable appropriate to the interface type of the peer device to be connected.

- If the interface impedance of the peer device is 75 ohm, use a 75-ohm 4E1/8E1 conversion cable.
- If the interface impedance of the peer device is 120 ohm, use a 120-ohm 4E1/8E1 conversion cable.

Step 2: Insert the DB-68 connector at one end of the 4E1/8E1 conversion cable to the DB-68 port on the FIC-IMA-4E1/FIC-IMA-8E1 card, and fasten the cable retaining screws.

Step 3: Identify the sequence numbers of the connectors at the other end of the 4E1/8E1 conversion cable and connect one connector (or a pair of connectors) to the peer device.

Step 4: Power on the router. Check the behavior of the LINK LED for the slot on the card panel: OFF means the line has problem and signal is out of synchronization. Check the link status.

FIC-IMA-4T1/FIC-IMA-8T1

Introduction

The 4-port/8-port T1 ATM inverse multiplexing interface card (FIC-IMA-4T1/FIC-IMA-8T1) provides four/eight T1 interfaces that support the IMA technology. Their network application is similar to that of the FIC-IMA-4E1/FIC-IMA-8E1 card.

Interface Attributes

The following table describes the interface attributes of the FIC-IMA-4T1/FIC-IMA-8T1:

Table 159 Interface attributes of the FIC-IMA-4T1/FIC-IMA-8T1

	Description	
Attribute	**FIC-IMA-4T1**	**FIC-IMA-8T1**
Connector	DB-68	
Number of connectors	1	
Interface standard	ITU-G.703, ITU-G.704	
Cable type	4T1 conversion cable (100-ohm straight-through shielded)	8T1 conversion cable (100-ohm straight-through shielded)
Max transmission distance	150 m (492.1 ft.)	
Operating mode	ATM T1 independent link/IMA bundle mode	
Supported service	AAL5	
Protocol	PPPoA, PPPoEoA, IPoA, IPoEoA	
Transmission rate	CBR/VBR-rt/VBR-nrt/UBR	

Interface LEDs

The following figures illustrate the FIC-IMA-4T1 and FIC-IMA-8T1 panels:

Figure 263 FIC-IMA-4T1 panel

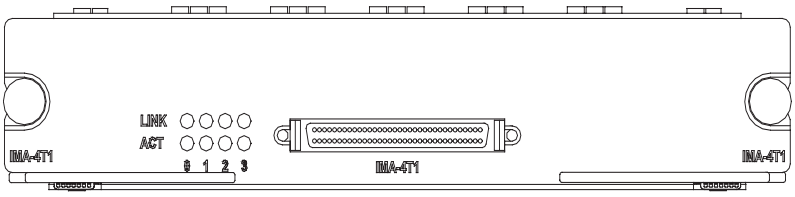
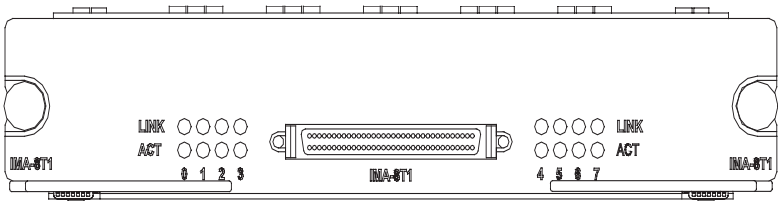


Figure 264 FIC-IMA-8T1 panel



The following table describes the LEDs on the FIC-IMA-4T1/FIC-IMA-8T1 panel:

Table 160 LEDs on the FIC-IMA-4T1/FIC-IMA-8T1 panel

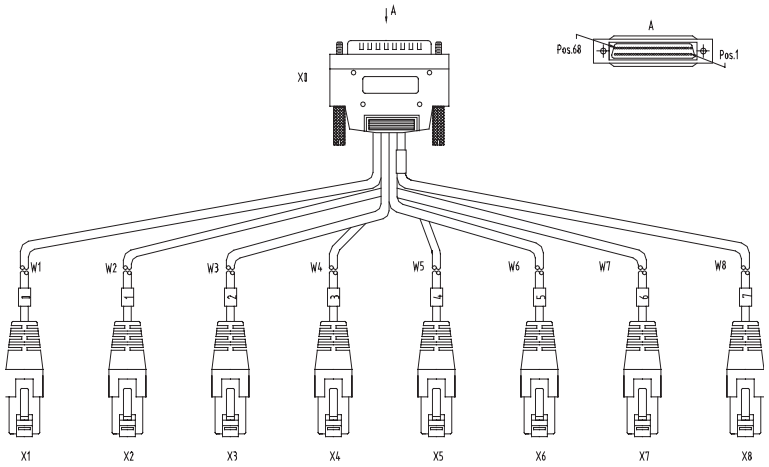
LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or transmitted.

Interface Cable

The FIC-IMA-4T1/FIC-IMA-8T1 card provides four/eight T1 ports and uses a 4T1/8T1 conversion cable for connection. At one end of the cable is a DB-68 connector for connecting the router and at the other end are four/eight RJ-45 connectors for connecting other devices.

The following figure illustrates an 8T1 conversion cable.

Figure 265 8T1 conversion cable



Connecting the Interface Cable

Step 1: Insert the DB-68 connector of the 4T1/8T1 conversion cable to the DB-68 port on the FIC-IMA-4T1/FIC-IMA-8T1 card.

Step 2: Connect one RJ-45 connector at the other end of the cable to the peer device to be connected.

Step 3: Power on the router. Check the behavior of the LINK LED on the card panel: OFF means the line has problem. Check the line status in this case.

FIC-1SHL-4W

Introduction

The 1-port dual-pair G.SHDSL interface card (FIC-1SHL-4W) provides a four-wire G.SHDSL interface. It adopts TCPAM coding and provides symmetric rates up to 4.624 Mbps. The transmission rate of the interface can automatically adapt to line distances and conditions.

Compared with ADSL, G.SHDSL allows farther transmission distance and thus has a wider application scope. It is an alternative to E1/T1 line for high-speed data service access. However, as TCPAM uses the band starting from 0 Hz for data transmission, G.SHDSL cannot share the same line with POTS or ISDN like what ADSL has done.

The FIC-1SHL-4W has these features:

- Supporting manual G.SHDSL line activation/deactivation and easy-to-use fault location tools.
- Supporting G.992.1 interface standard and auto-sensing.
- Allowing you to set the dual-pair G.SHDSL interface to operate in dual-pair or single-pair mode.

Interface Attributes

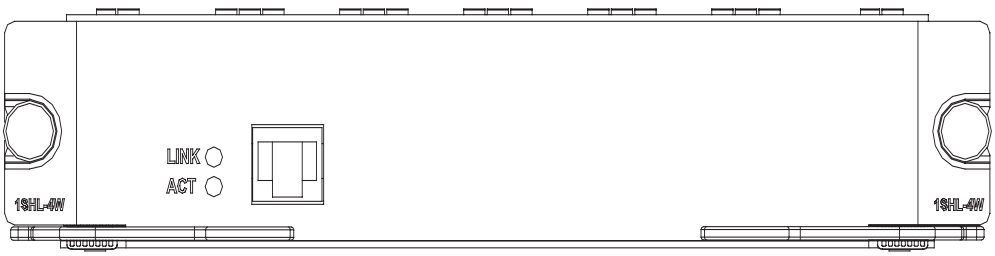
Table 161 Interface attributes of the FIC-1SHL-4W

Attribute	FIC-1SHL-4W
Connector	RJ-11
Number of connectors	1
Interface standard	ITU-T G991.2
	ITU-T G994.1 handshaking
Interface rate	In single-pair mode, supports the sending/receiving independent symmetric rates in the range from 192 kbps to 2312 kbps in steps of 8 kbps.
	In dual-pair mode, supports the sending/receiving independent symmetric rates in the range from 384 kbps to 4624 kbps in steps of 16 kbps.
Interface cable	Tailor-made 4-wire telephone cable
Supported services	G.SHDSL over ordinary telephone lines

Interface LEDs

The following figure illustrates the FIC-1SHL-4W panel:

Figure 266 FIC-1SHL-4W panel



The following table describes the LEDs on the FIC-1SHL-4W panel.

Table 162 LEDs on the FIC-1SHL-4W panel

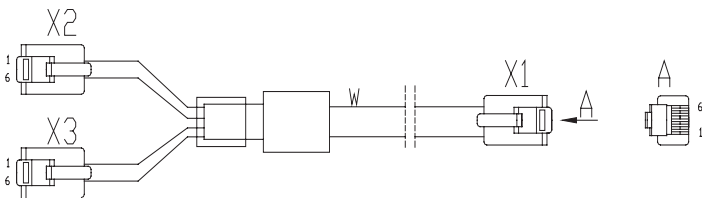
LED	Description
LINK	OFF means no link is present.
	ON means a link is present.
ACT	OFF means no data is being transmitted or received.
	Blinking means data is being received or transmitted.

Interface Cable

The FIC-1SHL-4W uses a tailor-made 4-wire telephone cable of type "Y" or "I". You can select the type as needed.

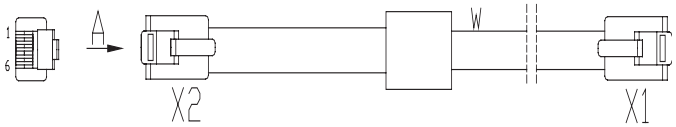
- As shown in the following figure, on one end of the type "Y" G.SHDSL cable there is one RJ-11 connector (X1), which is used to connect the FIC-1SHL-4W card. On the other end there are two RJ-11 connectors (X2 and X3), which can connect two 2-wire telephone cables. On X1, pins 3 and 4 are connected with pins 3 and 4 on X2, and pins 2 and 5 are connected with pins 3 and 4 on X3.

Figure 267 Type "Y" cable



- As shown in the following figure, on the two ends of the "I" type G.SHDSL cable there are RJ-11 connectors, which can connect one 4-wire telephone cables.

Figure 268 "I" type cable



Connecting the Interface Cable

- When using "Y" cable, connect the X1 end of the cable to the interface on FIC-1SHL-4W and connect the other two ends to DSLAM through PSTN.
- When using "I" cable, connect one end of the cable to the interface on FIC-1SHL-4W and the other end to DSLAM through PSTN.

FIC-1CPOS

Introduction

The 1-port channelized SDH/SONET interface card (FIC-1CPOS) provides one STM-1/OC3-compliant multi-channel interface and supports communication speeds up to 155.52 Mbps.

The FIC-1CPOS has two models: the FIC-1CPOS(E) for E1 system and the FIC-1CPOS(T) for T1 system.

The FIC-1CPOS communicates with the CPU through the PCI interface to receive and transmit data on the STM-1 channelized POS interface. It supports:

- Four types of hot swappable SFP optical interface modules for your choice: multi-mode short-haul (1310 nm), single-mode medium-haul (1310 nm), single-mode long-haul (1310 nm), and single-mode ultra-long-haul (1550 nm).
- Clear channel (unframed) E1 or T1.
- Fractional (framed) E1 or T1.
- Up to 256 64 kbps logical channels.

Interface Attributes

The following table describes the interface attributes of the FIC-1CPOS(E)/FIC-1CPOS(T).

Table 163 Interface attributes of the FIC-1CPOS(E)/FIC-1CPOS(T)

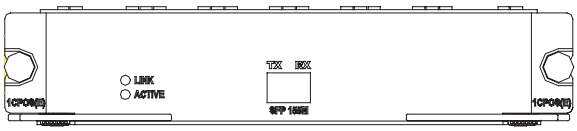
Attribute		**FIC-1CPOS(E)/FIC-1CPOS(T)**			
Connector		SFP/LC			
Number of Connectors		1			
Interface standard		SONET OC-3/SDH STM-1			
Interface rate		155.52 Mbps			
Optical transmitter power	Type	Multi-mode short-haul	Single mode medium-haul	Single mode long-haul	Single mode ultra-long-haul
	Min.	-19.0 dBm	-15.0 dBm	-5.0 dBm	-5.0 dBm
	Max.	-14.0 dBm	-8.0 dBm	0. dBm	0. dBm
Receiver sensitivity		-30.0 dBm	-28.0 dBm	-34.0 dBm	-34.0 dBm
Overload optical power		-14.0 dBm	-7.0 dBm	-9.0 dBm	-10.0 dBm
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Fiber type		62.5/125 μm multi-mode	9/125 μm single mode	9/125 μm single mode	9/125 μm single mode
Max. transmission segment		2 km (1.2 mi.)	15 km (9.3 mi.)	40 km (24.9 mi)	80 km (49.7 mi)

CAUTION: *For a long-haul fiber-optic interface, the transmission distance must be longer than 25 km (15.5 in.) to allow the receiver to work. In case of closer distances, insert an optical attenuator to reduce the input optical power.*

Interface LEDs

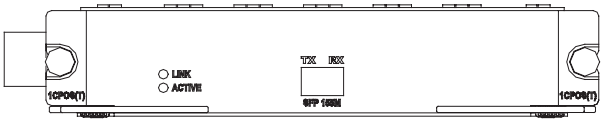
The following figure illustrates the FIC-1CPOS(E) panel:

Figure 269 FIC-1CPOS(E) panel



The following figure illustrates the FIC-1CPOS(T) panel:

Figure 270 FIC-1CPOS(T) panel



The following table describes the LEDs on the FIC-1CPOS(E) and FIC-1CPOS(T) panels.

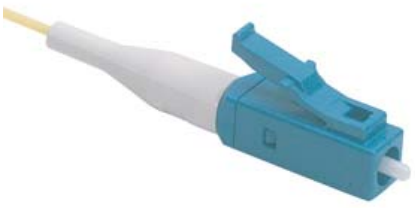
Table 164 LEDs on the FIC-1CPOS(E)/FIC-1CPOS(T) panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being received or transmitted.

Interface Optical Fiber

The FIC-1CPOS can only be connected with an optical fiber cable with an LC-type fiber-optic connector.

Figure 271 LC-type fiber-optic connector



Fiber-optic connectors: according to ITU, are passive components used to stably but not permanently connect two or more optical fibers. They are indispensable to a fiber-optic communications system in the sense that it allows add/drop connections between optical channels.

Many types of fiber-optic connectors are available, such as:

FC: round fiber-optic connector with screw thread

ST: round plug-in fiber-optic connector

LC: square fiber-optic connector

MT-RJ: square fiber-optic transceiver connector

Connecting the Interface Optical Fiber

Step 1: Insert the SFP card into its corresponding slot.

Step 2: Locate the Rx and Tx fiber-optic interfaces on the interface card. Use two fibers to connect the FIC-CPOS to another device: Rx to Tx and Tx to Rx.

Step 3: Power on the device and read the state of the LINK LED for the CPOS interface: ON means the Rx link is present and OFF means the opposite. In the latter case, check the line status.

WARNING: *Because invisible laser radiation may be emitted from the aperture of an optical port when no fiber is connected or the dust cap is removed, do not stare into the open aperture.*

Replace the dust cap when no fiber is connected to the optical port.

FIC-2BSV/FIC-4BSV Module

Introduction

The 2-port and 4-port ISDN BRI S/T voice interface cards (FIC-2BSV and FIC-4BSV) can be used to process ISDN voice traffic. In the upstream direction, it can be connected to user interfaces on an ISDN switch to receive and decompress, compress and transmit ISDN BRI digital voice traffic. In the downstream direction, it can be connected to TE devices to allow their voice traffic to be forwarded through a WAN interface on the router to the Internet, thus implementing VoIP. The interfaces on the FIC-2BSV/4BSV card are ITU-T I.430-compliant, adopting pseudo-ternary coding, providing 192 Kbps rate, and allowing the maximum transmission distance of 1 km (0.6 mi.) in point-to-point mode.

The FIC-2BSV/FIC-4BSV has these features:

- The BSV interfaces support two modes: user and network, respectively for connecting an ISDN network and a TE device.
- When a BSV interface works in network mode, traffic is processed as follows: The digital voice traffic received on the BSV interface is compressed and forwarded through the CPU on the main control board to a WAN interface. The IP voice traffic received on a WAN interface is forwarded through the CPU on the main control board to the FIC-2BSV/FIC-4BSV, where the traffic is decompressed and sent to the TE device.
- When a BSV interface works in user mode, traffic is processed as follows: The digital voice traffic received from the B channels on the BSV interface is decompressed and forwarded through the CPU on the main control board to a local FXS or FXO analog voice interface. The voice signals received on the local FXS or FXO analog voice interface are processed by VoIP and forwarded through the CPU on the main control board to the FIC-2BSV/FIC-4BSV, where the traffic is compressed and sent out of the BSV interface to the ISDN switch.
- In conjunction with FXS or FXO analog voice interface modules, the card provides flexibility in voice call routing.

- The signaling on the ISDN BRI D channel is processed separately by CPU.
- The BSV interfaces support remote power supply and can be connected to ISDN phones directly.
- The FIC-2BSV/FIC-4BSV is dedicated to voice applications, which is different from the BS interface cards where BRI data applications are supported.

Interface Attributes

The following table describes the interface attributes of the FIC-2BSV/FIC-4BSV.

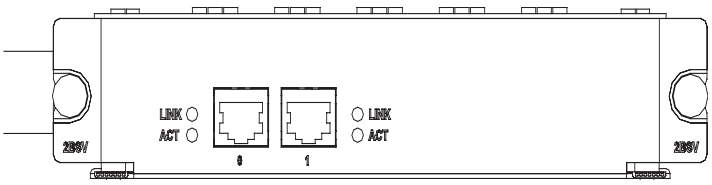
Table 165 Interface attributes of the FIC-2BSV/FIC-4BSV

Attribute	FIC-2BSV	FIC-4BSV
Connector	RJ-45	
Number of connectors	2	4
Interface standard	ITU-T I.430, Q.921, Q.931	
Interface rate	192 Kbps	
Cable	ISDN S interface cable	
Supported service	Voice access over ISDN S interface cable	

Interface LEDs

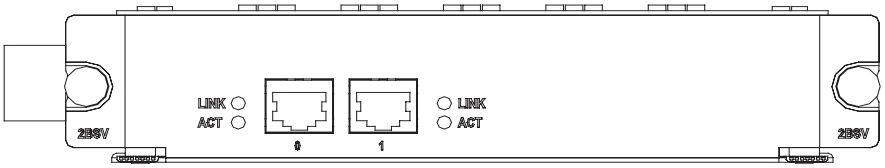
The following figure illustrates the FIC-2BSV panel.

Figure 272 FIC-2BSV panel



The following figure illustrates the FIC-4BSV panel.

Figure 273 FIC-4BSV panel



The following table describes the LEDs on the FIC-2BSV/FIC-4BSV panel.

Table 166 LEDs on the FIC-2BSV/FIC-4BSV panel

LED	Description
LINK	OFF means no link is present; ON means a link is present.
ACT	OFF means no data is being transmitted or received; blinking means data is being transmitted or received.

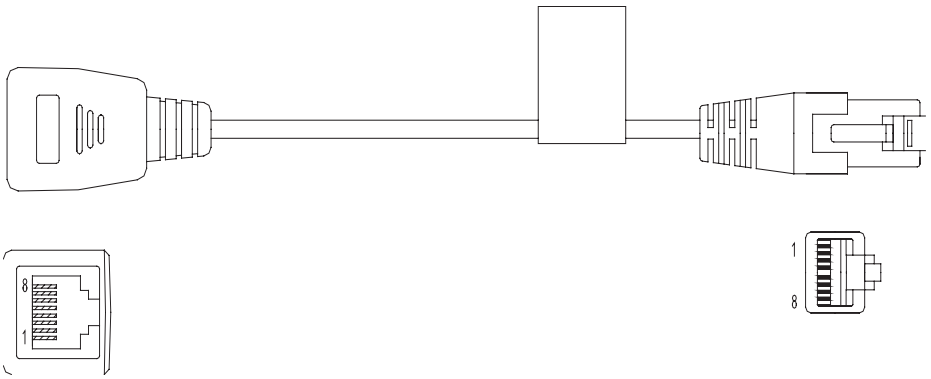
Interface Cable

When a BSV interface works in user mode, it uses a straight-through ISDN S/T interface cable for connection. At the two ends of the cable are RJ-45 connectors with pins 3 and 6 for data transmission and pins 4 and 5 for data receiving.

Figure 274 Straight-through ISDN S/T cable

When a BSV interface works in network mode, it uses a crossover ISDN S/T interface cable for connection, with pins 3 and 6 for data transmission and pins 4 and 5 for data receiving. At one end of the cable is an RJ-45 male connector for connecting the FIC-2BSV/FIC-4BSV interface and at the other end of the cable is an RJ-45 female connector for connecting a TE device.

Figure 275 Crossover ISDN S/T cable



Connecting the Interface Cable

CAUTION:

- *If outdoor cabling is involved, you need to install a lightning arrester at the input end of the ISDN BRI S/T interface cable to avoid lightning strike.*
- *When connecting the interface cable, pay attention to the mark on the interface to avoid wrong insertion, which may damage the interface card or even the router host.*

Step 1: Identify the operating mode of the BSV interface. If the interface is to be connected to an ISDN network, it should operate in user mode; if the interface is to be connected to a TE device, such as a digital phone or another BSV interface in user mode, the interface should operate in network mode.

Step 2: Connect the cable.

1 To connect the module to an ISDN network, identify the type of the ISDN line provided by your telecommunications service provider.
   - If it is an ISDN U interface line, use an NT1 for conversion. Insert one end of the S/T interface cable into the S/T interface on the NT1 and the other end to a BSV interface on the FIC-2BSV/FIC-4BSV.
   - If it is an ISDN S/T interface line, directly connect the cable to a BSV interface on the FIC-2BSV/FIC-4BSV.
2 To connect the module to a TE device, use a crossover S/T interface cable. Connect the RJ-45 plug at one end of the cable to the FIC-2BSV/FIC-4BSV interface, the RJ-45 receptacle to a straight-through S/T interface cable, and then the straight-through cable to the TE device.

FIC-24FXS

Introduction

The 24-port voice subscriber circuit interface card (FIC-24FXS) processes and transmits voice signals over data communications networks for 24 regular analog phones, faxes, or AT0 loop trunks of telephone exchanges. It occupies two FIC slots.

Interface Attributes

Table 167 Interface attributes of the FIC-24FXS card

Attribute	Description
Connector	50-pin D-type female connector
Interface standard	FXS interface
Interface rate	24 × FXS interface rate

Interface LEDs

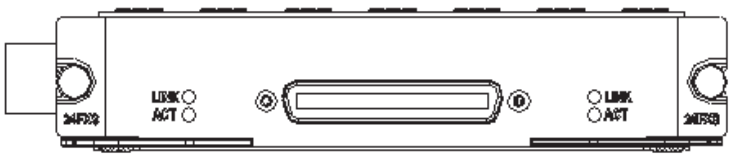
FIC-24FXS has two kinds of LEDs, Active and Link.

Table 168 Description of LEDs on the FIC-24FXS panel

LED	Description
Active	OFF means all links are idle. Blinking means one or more links are occupied.
Link	Steady ON means no fault occurs on the link

The following figure illustrates the FIC-24FXS panel.

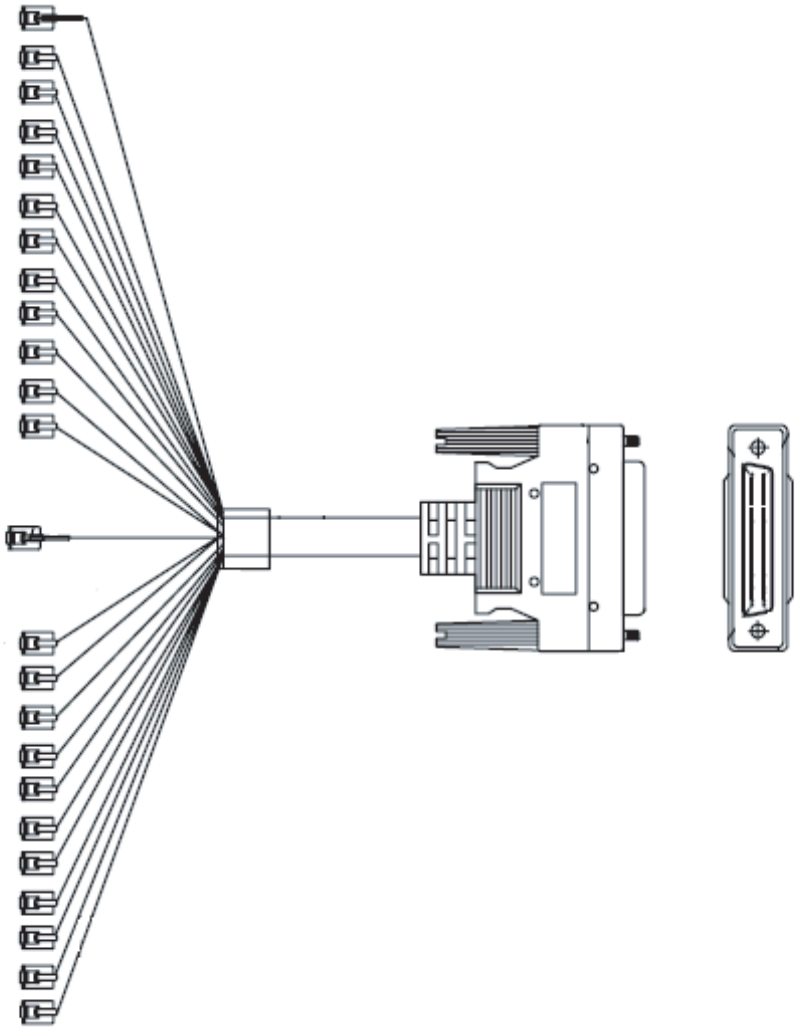
Figure 276 FIC-24FXS front panel



Interface Cable

FIC-24FXS uses a 5 m (16.4 ft.) or 15 m (49.2 ft.) telephone conversion cable. At one end of the cable is a D50 male connector that is used to connect to the FIC-24FXS card; at the other end are 24 RJ11 connectors.

Figure 277 FIC-24FXS conversion cable



You can connect the RJ11 connectors to your cable distribution frame, or connect them to the phones directly or after being prolonged.

Connecting the Interface Cable

Step 1: Connect the D50 male connector on one end of the cable to the card.

Step 2: Connect the RJ11 connectors on the other end of the cable to telephones, Faxes or the AT0 loop trunk lines of the telephone switchboards.

CAUTION: *The screws at both sides of the FIC-24FXS module interface should be fixed to avoid loss of them.*

DFIC-24FXO24FXS

Introduction

The DFIC-24FXO24FXS provides 24-port voice subscriber circuit and 24-port voice AT0 analog trunk circuit. FXS interfaces process and transmit voice signals over data communications networks for 24 regular analog phones, faxes, or AT0 loop trunks of telephone exchanges. The FXO interfaces process and transmit voice signals over data communications networks for 24 loops of telephone exchanges.

Interface Attributes

Table 169 Interface attributes of the DFIC-24FXO24FXS module

Attribute	Description
Connector	50-pin D-type female connector
Interface standard	FXS and FXO interface
Interface rate	24 × FXO interface rate plus 24 × FXS interface rate

Interface LEDs

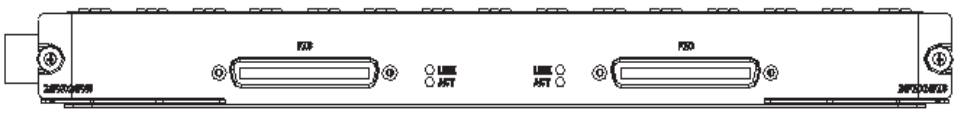
DFIC-24FXO24FXS has two kinds of LEDs, Active and Link.

Table 170 Description of LEDs on the DFIC-24FXO24FXS panel

LED	FXO interface	FXS interface
Active	OFF means all links are idle. Blinking means one or more links are occupied.	OFF means all links are idle. Blinking means one or more links are occupied.
Link	Steady ON if an electric device is connected.	Steady ON means no fault occurs on the link

The following figure illustrates the DFIC-24FXO24FXS panel.

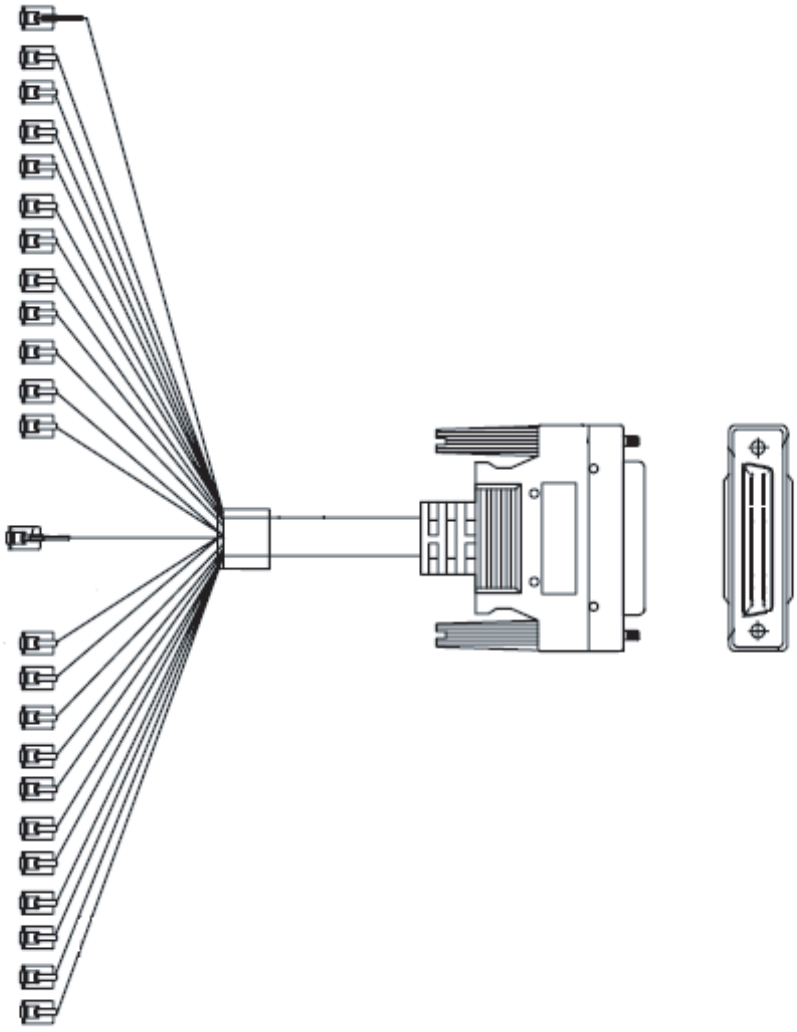
Figure 278 DFIC-24FXO24FXS front panel



Interface Cable

DFIC-24FXO24FXS uses a 5 m (16.4 ft.) or 15 m (49.2 ft.) telephone conversion cable. At one end of the cable is a D50 male connector that is used to connect to the DFIC-24FXO24FXS card; at the other end are 24 RJ11 connectors.

Figure 279 DFIC-24FXO24FXS conversion cable



Based on the actual needs, the RJ11 connectors of the FXS interface conversion cable can be connected to the cable distribution frame or to the phones directly or after being prolonged. And the RJ11 connectors of the FXO interface cable can be connected to a subscriber's PBX or to the subscriber line at the Central Office.

Connecting the Interface Cable

Step 1: Connect the D50 male connector on one end of the cable to the card.

Step 2: Connect the RJ11 connectors on the other end of the cable to the following devices:

- Telephones, Faxes or the AT0 loop trunk lines of the telephone switchboard if FXS is used.
- Regular subscriber lines of the telephone switchboard if FXO is used.

CAUTION: *The screws at both sides of the DFIC-24FXO24FXS module interface should be fixed to avoid loss of them.*

5 ESM/VCPM MODULE

ANDE Module

Introduction

ANDE (advanced network data encryption card) supports IPSec and hardware expedited IP data packet encryption, thus providing encryption with high performance and reliability.

- Installed with an ANDE card, the main board of your router can implement VPN with encryption provided by the ANDE card in addition to IP packet forwarding.

Interface Attributes

The following table describes the interface attributes of the FIC-HNDE.

Table 171 Interface attributes of the ANDE module

Attribute	Description
Protocol supported	IPSec
IPSec concurrent tunnels	100 (implemented through software)
Hardware algorithm	key algorithm (DES, 3DES, AES, QC5, Blowfish, Cast-128 and SkipJack)
	Authentication algorithm (HMAC-MD5-96, HMAC-SHA-1-96)

Interface LEDs

There is no LED on the ANDE module. Display of the status of the module is implemented through the ESM interface LED on the main board of the router.

The following table describes the LEDs on the panel.

Table 172 Description of the LEDs on the panel

LED	Description
ESMx	Green: ANDE card is in the slot and is operating normally.
	Yellow: ANDE card is in the slot but cannot be accessed by the router.

Note:

x means the number of the slot the ESM LED is in.

Installing/Removing ANDE Card

ANDE card should be installed on the main board and the ESM slot on the MSCA card of MSR 20/30/50 router. The board that provides ESM slots is referred to hereafter as mother board. Suppose the mother board is uninstalled and put on the workbench.

Removing ANDE card

Follow these steps to remove the ANDE card:

Step 1: Remove the fastening screws on the ANDE card.

Step 2: Remove the ANDE card from the mother board. Do not overexert when removing the ANDE card because the connector of the daughter board is still on the mother board.

Step 3: If no ANDE card is to be installed, for an MSCA card, remove the four screws fastening the metal standoff on the daughter board and take the four metal standoffs. For other mother boards, remove the four metal standoffs.

Installing ANDE card

Follow these steps to install ANDE card:

Step 1: Confirm the correct position of the ANDE card on the

Step 2: For MSCA card, fasten the four metal standoffs which fasten and support ANDE card. For other mother boards, fasten the four metal standoffs on the mother board. Step 3: Install the ANDE card on the mother board and fasten it with four screws. During installation, align the two connectors under the daughter board to the connectors on the main board to avoid damage to the connectors.

CAUTION: *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the interface card and even damage the router.*

SNDE Module

Introduction

SNDE (Standard network data encryption card) supports IPSec and hardware expedited IP data packet encryption, thus providing encryption with high performance and reliability.

Installed with an SNDE card, the main board of your router can implement VPN with encryption provided by the SNDE card in addition to IP packet forwarding.

Interface Attributes

The following table describes the interface attributes of the FIC-HNDE.

Table 173 Interface attributes of the SNDE module

Attribute	Description
Protocol supported	IPSec
IPSec concurrent tunnels	100 (implemented through software)
Hardware algorithm	key algorithm (DES, 3DES, AES, QC5, Blowfish, Cast-128 and SkipJack)
	Authentication algorithm (HMAC-MD5-96, HMAC-SHA-1-96)

Interface LEDs

There is no LED on the SNDE module. Display of the status of the module is implemented through the ESM interface LED on the main board of the router.

The following table describes the LEDs on the SNDE panel.

Table 174 Description of the LEDs on the SNDE

LED	Description
ESMx	Green: SNDE card is in the slot and is operating normally.
	Yellow: SNDE card is in the slot but cannot be accessed by the router.

Note:

x means the number of the slot the ESM LED is in.

Installing/Removing SNDE Card

SNDE card should be installed on the main board and the ESM slot on the MSCA card of MSR 20/30 router. The board that provides ESM slots is referred to hereafter as mother board. Suppose the mother board is uninstalled and put on the workbench.

Removing SNDE card

Follow these steps to remove the SNDE card:

Step 1: Remove the fastening screws on the SNDE card.

Step 2: Remove the SNDE card from the mother board. Do not overexert when removing the SNDE card because the connector of the daughter board is still on the mother board.

Step 3: If no SNDE card is to be installed, for an MSCA card, remove the four screws fastening the metal standoff on the daughter board and take the four metal standoffs. For other mother boards, remove the four metal standoffs.

Installing SNDE card

Follow these steps to install SNDE card:

Step 1: Confirm the correct position of the SNDE card on the

Step 2: For MSCA card, fasten the four metal standoffs which fasten and support SNDE card. For other mother boards, fasten the four metal standoffs on the mother board. Step 3: Install the SNDE card on the mother board and fasten it with four screws. During installation, align the two connectors under the daughter board to the connectors on the main board to avoid damage to the connectors.

CAUTION: *You should connect a cable to the port with the correct mark. Misplugging is prone to impair the interface module and even damage the router.*

VCPM Module

Introduction

VCPM, voice co-processing module, provides transmission channel between DSP strip and system memory for voice data, thus implementing TDM HW exchange for each PCM data voice channel.

VCPM module is a required module for voice communications of routers.

Interface Attributes

Table 175 Interface attributes of the VCPM module

Attribute	Description
Connector	Double-edge connector
Interface type	PCI 2.2, EHPI
Data transmission rate	Operating rate for PCI bus: 33 MHz/66 MHz
	Maximum bandwidth: 264 Mbps
	BURST transmission: Up to 1 KB of data can be transmitted once and the maximum number of bytes transmitted can be configured.

Interface LEDs

There is no LED on the VCPM card and display of the status of the module is implemented through the VCPM interface LED on the main board of the router.

The following table describes the LEDs on the main board:

Table 176 Description on the LEDs

LED	Description
VCPMx	Green: VCPM card is in the slot and is operating normally.
	Yellow: VCPM card is in the slot but cannot be accessed by the router.
Note:	
X means the slot number VCPM card LED is on.	

Installing/Removing VCPM Card

VCPM card should be installed on the main board of the MSR 30 router and on the VCPM slot on the MSCA card of MSR 30 router. The board that provides VCPM slots is referred to hereafter as mother board. Suppose the mother board is uninstalled and put on the workbench.

Removing VCPM card

Follow these steps to uninstall the VCPM card:

Step 1: Remove the three fastening screws on the VCPM card.

Step 2: Remove the VCPM card from the mother board. Do not overexert when removing the VCPM card because the connector of the daughter board is still on the mother board.

Step 3: If no SNDE card is to be installed, remove the three metal standoffs

Installing VCPM card

Follow these steps to install VCPM card:

Step 1: Confirm the correct position of the VCPM card on the mother board.

Step 2: Fasten the three metal standoffs on the mother board.

Step 3: Install the VCPM card on the mother board and fasten it with three screws. During installation, align the two connectors under the daughter board to the connectors on the main board to avoid damage to the connectors.

CAUTION: *You should align the three fastening holes on the VCPM card to the three fastening holes or metal standoffs on the mother board. Misplugging is prone to impair the interface module and even damage the router.*

VCPM Card Application Example

If a user wants to perform voice communication through data voice interface, besides using data voice interface board, he can also install a VCPM card on the main board of an MSR 30 series router or in the VCPM slot on the MSCA card on an MSR 50 series router, with a certain number of VPM strips installed in the VPM slot as needed.

A router installed with RTV-SIC-1E1/T1 module

RTV-SIC-1E1/T1 module consumes VCPM and VPM resource when it is operating normally. Therefore, with RTV-SIC-1E1/T1 installed on a router, VCPM card and certain numbers of VPM should also be installed on the main board for MSCA board of the router.

If there is an RTV-SIC-1E1/T1 module on the router but no VCPM or VPM card is installed, the router may operate abnormally.

A router installed with no RTV-SIC-1E1/T1 module

If there is no RTV-SIC-1E1/T1 module in the system, no VCPM and VPM are needed on a router. However, when a router is installed with voice E1/T1 module of other types and there is data exchange between voice E1/T1 modules, the main board of the router should be installed with VCPM card. VPM should be installed as needed.

A Interface Card and Interface Module Purchase Guide

This Appendix tells you the types of interface modules that each model of H3C MSR 20/30/50 Series Routers can accommodate. In the tables, "√" means "Supported" and "×" means "Not supported".

For H3C MSR 20-40 and MSR 30 and 50 series routers which have four SIC slots, a 4FSW/1FEF/1FEA/1GEC/1ADSL/1ADSL-I interface card can only be installed in slot 2 or slot 4.

SIC/DSIC Purchase Guide

Table 177 SIC/DSIC options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
SIC-1GEC	√	√	√	√	√	√	√
SIC-4FSW	√	√	√	√	√	√	√
DSIC-9FSW	×	√	×	√	√	√	√
SIC-1VE1	×	√	×	√	√	√	√
SIC-1VT1	×	√	×	√	√	√	√
SIC-4FSW-POE	×	×	×	√	√	√	√
DSIC-9FSW-POE	×	×	×	√	√	√	√
SIC-1BS	√	√	√	√	√	√	√
SIC-2BS	×	√	×	√	√	√	√
SIC-1BU	√	√	√	√	√	√	√
SIC-2BU	×	√	×	√	√	√	√
SIC-1BSV	√	√	√	√	√	√	√
SIC-2BSV	×	√	×	√	√	√	√
SIC-1FEF	√	√	√	√	√	√	√
SIC-1FEA	√	√	√	√	√	√	√
SIC-1SAE	√	√	√	√	√	√	√
SIC-1E1-F	√	√	√	√	√	√	√
SIC-1T1-F	√	√	√	√	√	√	√
SIC-EPRI	√	√	√	√	√	√	√
SIC-TPRI	√	√	√	√	√	√	√
SIC-1FXS	√	√	√	√	√	√	√
SIC-2FXS	√	√	√	√	√	√	√
SIC-1FXO	√	√	√	√	√	√	√
SIC-2FXO	√	√	√	√	√	√	√
SIC-1ADSL-I	√	√	√	√	√	√	√

Table 177 SIC/DSIC options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
SIC-1ADSL	√	√	√	√	√	√	√
SIC-1AM	√	√	√	√	√	√	√
SIC-2AM	×	√	×	√	√	√	√

MIM/DMIM Purchase Guide

Table 178 MIM/DMIM options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
MIM-1VE1	×	×	√	√	√	√	×
MIM-1VT1	×	×	√	√	√	√	×
MIM-2VE1	×	×	√	√	√	√	×
MIM-2VT1	×	×	√	√	√	√	×
MIM-16FSW	×	×	√	√	√	√	×
DMIM-24FSW	×	×	×	×	×	√	×
MIM-OAP[1]	×	×	√	√	√	√	×
MIM-OAP-A[1]	×	×	√	√	√	√	×
MIM-ASM	×	×	√	√	√	√	×
MIM-OAP-B[1]	×	×	√	√	√	√	×
MIM-16FSW-POE	×	×	√	√	√	√	×
DMIM-24FSW-POE	×	×	×	×	×	√	×
MIM-1FE	×	×	√	√	√	√	×
MIM-2FE	×	×	√	√	√	√	×
NS-MIM-4FE	×	×	√	√	√	√	×
MIM-1GBE	×	×	√	√	√	√	×
MIM-2GBE	×	×	√	√	√	√	×
MIM-1GEF	×	×	√	√	√	√	×
MIM-2GEF	×	×	√	√	√	√	×
MIM-2SAE	×	×	√	√	√	√	×
MIM-4SAE	×	×	√	√	√	√	×
MIM-8SAE	×	×	√	√	√	√	×
MIM-8ASE	×	×	√	√	√	√	×
MIM-16ASE	×	×	√	√	√	√	×
MIM-1E1	×	×	√	√	√	√	×
MIM-2E1	×	×	√	√	√	√	×
MIM-4E1	×	×	√	√	√	√	×
MIM-8E1(120)	×	×	√	√	√	√	×
MIM-8E1(75)	×	×	√	√	√	√	×
MIM-1E1-F	×	×	√	√	√	√	×
MIM-2E1-F	×	×	√	√	√	√	×
MIM-4E1-F	×	×	√	√	√	√	×
MIM-8E1(120)-F	×	×	√	√	√	√	×

Table 178 MIM/DMIM options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
MIM-8E1(75)-F	×	×	√	√	√	√	×
MIM-1T1	×	×	√	√	√	√	×
MIM-2T1	×	×	√	√	√	√	×
MIM-4T1	×	×	√	√	√	√	×
MIM-8T1	×	×	√	√	√	√	×
MIM-1T1-F	×	×	√	√	√	√	×
MIM-2T1-F	×	×	√	√	√	√	×
MIM-4T1-F	×	×	√	√	√	√	×
MIM-8T1-F	×	×	√	√	√	√	×
MIM-2FXS	×	×	√	√	√	√	×
MIM-4FXS	×	×	√	√	√	√	×
MIM-2FXO	×	×	√	√	√	√	×
MIM-4FXO	×	×	√	√	√	√	×
MIM-4BSE	×	×	√	√	√	√	×
MIM-1CT3	×	×	√	√	√	√	×
MIM-1CE3	×	×	√	√	√	√	×
MIM-HNDE	×	×	√	√	√	√	×
MIM-1POS	×	×	√	√	√	√	×
MIM-2EM	×	×	√	√	√	√	×
MIM-4EM	×	×	√	√	√	√	×
MIM-1G.SHDSL	×	×	√	√	√	√	×
MIM-1AMM	×	×	√	√	√	√	×
MIM-1ASL	×	×	√	√	√	√	×
MIM-1ASM	×	×	√	√	√	√	×
MIM-1AE3	×	×	√	√	√	√	×
MIM-1AT3	×	×	√	√	√	√	×
MIM-1CPOS(E)	×	×	√	√	√	√	×
MIM-1CPOS(T)	×	×	√	√	√	√	×
MIM-IMA-4T1	×	×	√	√	√	√	×
MIM-IMA-8T1	×	×	√	√	√	√	×
MIM-IMA-4E1(120)	×	×	√	√	√	√	×
MIM-IMA-4E1(75)	×	×	√	√	√	√	×
MIM-IMA-8E1(120)	×	×	√	√	√	√	×
MIM-IMA-8E1(75)	×	×	√	√	√	√	×
MIM-1SHL-4W	×	×	√	√	√	√	×
MIM-2BSV	×	×	√	√	√	√	×
MIM-4BSV	×	×	√	√	√	√	×

1 Note that in some regions, the OAP modules are sold as "OSM" modules. They are identical in function.

FIC/DFIC Purchase Guide

Table 179 FIC/DFIC options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
FIC-1VE1	×	×	×	×	×	×	√
FIC-1VT1	×	×	×	×	×	×	√
FIC-2VE1	×	×	×	×	×	×	√
FIC-2VT1	×	×	×	×	×	×	√
FIC-16FSW	×	×	×	×	×	×	√
DFIC-24FSW	×	×	×	×	×	×	√
FIC-OAP[1]	×	×	×	×	×	×	√
FIC-ASM	×	×	×	×	×	×	√
FIC-OAP-A[1]	×	×	×	×	×	×	√
FIC-16FSW-POE	×	×	×	×	×	×	√
DFIC-24FSW-POE	×	×	×	×	×	×	√
FIC-1FE	×	×	×	×	×	×	√
FIC-2FE	×	×	×	×	×	×	√
FIC-4FE	×	×	×	×	×	×	√
FIC-1GBE	×	×	×	×	×	×	√
FIC-2GBE	×	×	×	×	×	×	√
FIC-1GEF	×	×	×	×	×	×	√
FIC-2GEF	×	×	×	×	×	×	√
FIC-2SAE	×	×	×	×	×	×	√
FIC-4SAE	×	×	×	×	×	×	√
FIC-8SAE	×	×	×	×	×	×	√
FIC-8ASE	×	×	×	×	×	×	√
FIC-16ASE	×	×	×	×	×	×	√
FIC-1E1	×	×	×	×	×	×	√
FIC-2E1	×	×	×	×	×	×	√
FIC-4E1	×	×	×	×	×	×	√
FIC-8E1(75)	×	×	×	×	×	×	√
FIC-8E1(120)	×	×	×	×	×	×	√
FIC-1E1-F	×	×	×	×	×	×	√
FIC-2E1-F	×	×	×	×	×	×	√
FIC-4E1-F	×	×	×	×	×	×	√
FIC-8E1(75)-F	×	×	×	×	×	×	√
FIC-8E1(120)-F	×	×	×	×	×	×	√
FIC-1T1	×	×	×	×	×	×	√
FIC-2T1	×	×	×	×	×	×	√
FIC-4T1	×	×	×	×	×	×	√
FIC-8T1	×	×	×	×	×	×	√
FIC-1T1-F	×	×	×	×	×	×	√
FIC-2T1-F	×	×	×	×	×	×	√
FIC-4T1-F	×	×	×	×	×	×	√

Table 179 FIC/DFIC options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
FIC-8T1-F	×	×	×	×	×	×	√
FIC-4BSE	×	×	×	×	×	×	√
FIC-1CE3	×	×	×	×	×	×	√
FIC-1CT3	×	×	×	×	×	×	√
FIC-2FXS	×	×	×	×	×	×	√
FIC-4FXS	×	×	×	×	×	×	√
FIC-2FXO	×	×	×	×	×	×	√
FIC-4FXO	×	×	×	×	×	×	√
FIC-HNDE	×	×	×	×	×	×	√
FIC-1POS	×	×	×	×	×	×	√
FIC-2EM	×	×	×	×	×	×	√
FIC-4EM	×	×	×	×	×	×	√
FIC-1G.SHDSL	×	×	×	×	×	×	√
FIC-1ATM-OC3MM	×	×	×	×	×	×	√
FIC-1ATM-OC3SML	×	×	×	×	×	×	√
FIC-1ATM-OC3SM	×	×	×	×	×	×	√
FIC-1AE3	×	×	×	×	×	×	√
FIC-1AT3	×	×	×	×	×	×	√
FIC-1CPOS(E)	×	×	×	×	×	×	√
FIC-1CPOS(T)	×	×	×	×	×	×	√
FIC-IMA-4T1	×	×	×	×	×	×	√
FIC-IMA-8T1	×	×	×	×	×	×	√
FIC-IMA-4E1(120)	×	×	×	×	×	×	√
FIC-IMA-4E1(75)	×	×	×	×	×	×	√
FIC-IMA-8E1(120)	×	×	×	×	×	×	√
FIC-IMA-8E1(75)	×	×	×	×	×	×	√
FIC-1SHL-4W	×	×	×	×	×	×	√
FIC-2BSV	×	×	×	×	×	×	√
FIC-4BSV	×	×	×	×	×	×	√
FIC-24FXS	×	×	×	×	×	×	√
DFIC-24O24S	×	×	×	×	×	×	√

1 Note that in some regions, the OAP modules are sold as "OSM" modules. They are identical in function.

ESM/VPM/VCPM Purchase Guide

Table 180 ESM/VPM/VCPM options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
ESM-ANDE	√	√	√	√	√	√	√
ESM-SNDE	√	√	√	√	√	√	√
VCPM	×	√	×	√	√	√	√

Table 180 ESM/VPM/VCPM options

Interface card type	20-20/ 20-21	20-40	30-11	30-16	30-20	20-40/ 30-60	50-40/ 50-60
VPM32	×	√	×	√	√	√	√
VPM24	×	√	×	√	√	√	√
VPM16	×	√	×	√	√	√	√
VPM8	×	√	×	√	√	√	√